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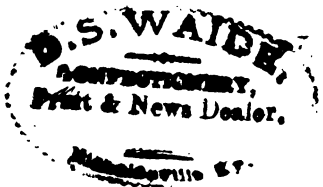
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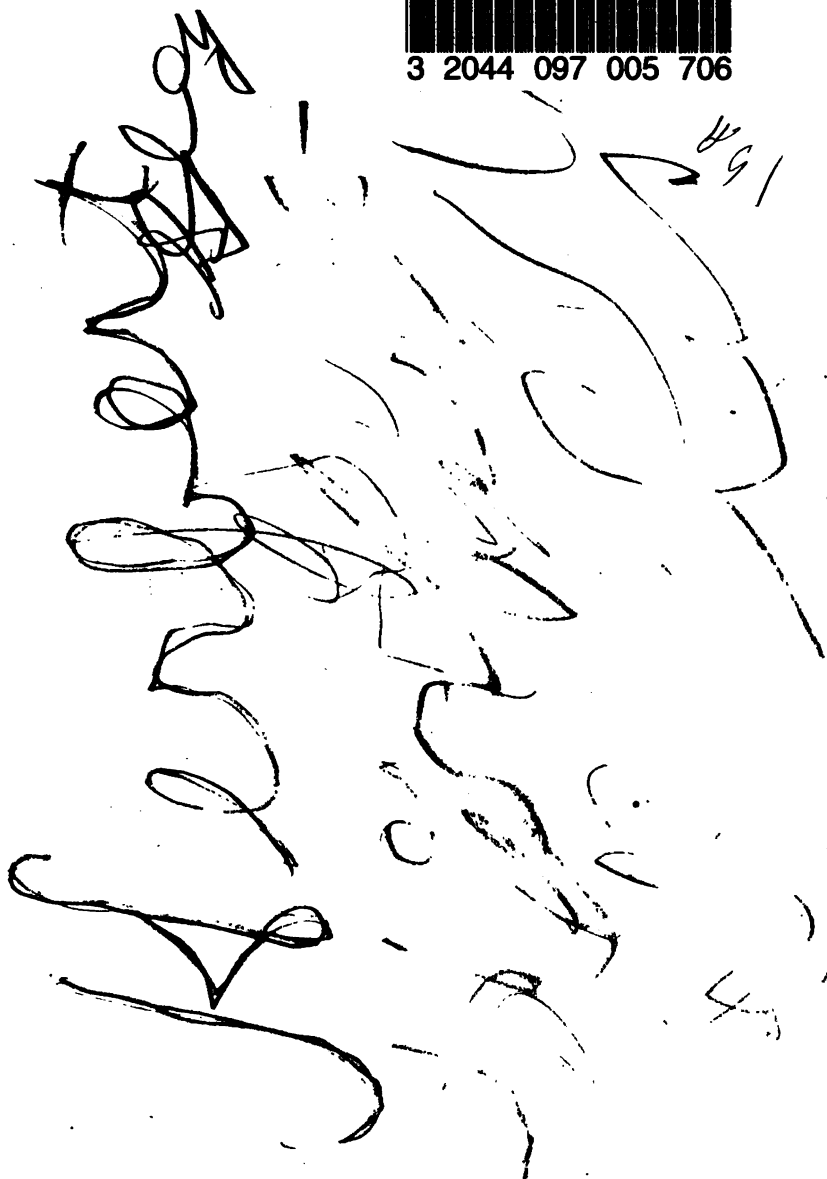
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6 RAY'S MODERN
INTELLECTUAL ARITHMETIC

A REVISED EDITION OF
RAY'S "INTELLECTUAL ARITHMETIC"



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RAY'S MOD. INTEL. ARITH.

E-P 13

PREFACE

THE object of this revision of Ray's "New Intellectual Arithmetic" is to adapt the book more thoroughly to modern methods of instruction, without destroying any of the features that have so long held the favor of thousands of teachers and pupils.

Many important improvements have been introduced, with a design to impart completeness, and give a concise and progressive course of arithmetical analysis.

The volume in its present form embraces :

1. Exercises on the primary principles and their applications, together with models of analysis in the shape of *solutions*.

2. A progressive and comprehensive presentation of Fractions, intended to render the subject intelligible and attractive.

3. General reviews, designed to test the pupil's knowledge of principles, preparatory to the applications of mental analysis which follow.

4. Reduction, Practical Measurements, and Percentage, with the application of the latter to Profit and Loss, Commission, Insurance, and Interest.

Much work in pure number has been added to supply the drill that leads to accuracy and rapidity in reckoning.

The value of Intellectual Arithmetic is so highly appreciated that little need be said in its favor. When properly taught, it is one of the most useful and interesting studies in which students can engage. It forces the pupil to reason, to analyze, to think for himself; while it imparts confidence in his reasoning powers and strengthens his mental faculties.

TO TEACHERS

THE solution of an example in Mental Arithmetic is herein regarded as a direct and natural response to the requirements of the problem; it aims to be a plain and simple statement of the successive steps leading to the final result or *answer*. The data afforded by the example are repeated in the solution no further than is necessary for its clear statement.

Every different class of examples is furnished with a solution; in a few instances more than one solution is given, the succeeding solutions offering a briefer method. No solution is repeated; and, when a solution, in whole or in part, occurs in a subsequent solution as a portion of the argument, its result is given as briefly as possible. Of course, there is nothing to prevent the teacher from elaborating any solution, or any portion of it, to the fullest extent he sees fit.

MODERN INTELLECTUAL ARITHMETIC



ADDITION

LESSON I

The numbers from one to ten are written and printed as follows:

	One	Two	Three	Four	Five
Written	1	2	3	4	5
Printed	1	2	3	4	5
	Six	Seven	Eight	Nine	Ten
Written	6	7	8	9	10
Printed	6	7	8	9	10

1. Ella put 1 glove on her right hand and 1 on her left hand. How many gloves had she on? *Ans.* 2.

Why? *Ans.* Because 1 and 1 are 2.

2. Herbert had 2 cents, and earned 1 cent more. How many cents had he in all? *Ans.* 3.

Why? *Ans.* Because 2 and 1 are 3.

3. Robert had 1 tennis ball, and bought 3 balls more. How many did he then have? *Ans.* 4.

Why? *Ans.* Because 1 and 3 are 4.

4. Ada had 4 books, and her mother gave her 1 book more. How many books had she all together?

5. Frank had 2 marbles, and George gave him 2 more. How many marbles did he then have?

6. How many are 3 blocks and 2 blocks?

7. Jean had 3 dolls, and on Christmas got 3 more. How many dolls had she then?

8. There are 4 windows in one room and 2 in another. How many windows are there in both rooms?

9. In a vase there are 3 pansies, 2 daisies, and 1 rose. How many flowers are there in the vase?

10. Ethel had 4 kittens, and a friend gave her 3 more. How many kittens did she then have?

11. How many fingers have you on one hand? How many have you on both hands?

12. Ruth had 4 cents. Her mother gave her 3 cents more at one time and 1 cent at another. How many cents had she all together?

LESSON II

1. Three rolls and 3 rolls and 2 rolls are how many rolls?

2. Four cents and 3 cents and 2 cents are how many cents?

3. Five marbles and 2 marbles and 1 marble are how many marbles?

4. John had 5 books, and his mother gave him 2 more books at one time and 3 at another. How many books did he then have?

5. Five boys and 4 boys and 1 boy are how many boys?

6. There are 5 children on one bench, 3 on another, and 1 on another. How many are there on the three benches?

7. Three shells and 6 shells and 1 shell are how many shells?

8. A lady paid 1 dollar for gloves, 3 dollars for a shawl, and 3 dollars for a dress. How much did she spend?

9. Four cents and 3 cents and 3 cents and 1 cent are how many cents?

10. If a man buys 6 pounds of butter at one time, 2 pounds at another time, and 2 pounds at another time, how much does he buy?

11. Seven days and 1 day and 2 days are how many days?

12. Dick has 3 cents, his sister 2 cents, and his brother 2 cents. If all the money were given to Dick, how much would he have?

13. How many are 4 and 4 and 2?

14. Ella paid 2 cents for thread and 2 cents for pins, and had 4 cents left. How much money had she at first?

Addition is the process of uniting two or more numbers. The result is called the **sum**, or **amount**.

The sign of addition (+) is called **plus**. The sign of equality (=) is read *equals*, or *is equal to*.

LESSON III

The numbers from eleven to twenty are written and printed as follows:

	Eleven	Twelve	Thirteen	Fourteen	Fifteen
Written	11	12	13	14	15
Printed	11	12	13	14	15
	Sixteen	Seventeen	Eighteen	Nineteen	Twenty
Written	16	17	18	19	20
Printed	16	17	18	19	20

1. One and 1 are how many? 1 and 2? 2 and 1? 3 and 1? 1 and 3? 4 and 1? 1 and 4? 1 and 5? 5 and 1? 1 and 6? 6 and 1? 1 and 7? 7 and 1? 8 and 1? 1 and 8? 9 and 1? 1 and 9?

SOLUTION.—One and one are two.

2. Two and 4 and 1 are how many? 6 and 2 and 3? 4 and 1 and 4?

SOLUTION.—Two and four are six; six and one are seven.

3. Five and 2 are how many? 7 and 3? 2 and 6 and 1? 2 and 1 and 2? 3 and 5? 5 and 4?

4. Nine and 2 are how many? 6 and 1 and 1? 6 and 3? 6 and 4? 7 and 1 and 3? 1 and 2 and 8? 1 and 3 and 8?

5. Eight and 2 are how many? 8 and 3? 10 and 2 and 1? 1 and 4 and 6? 8 and 4? 7 and 4? 6 and 7? 7 and 1 and 4? 1 and 8 and 2 and 2?

6. Ten and 2 are how many? 9 and 3? 9 and 1 and 2? 9 and 1 and 3? 5 and 6? 1 and 4 and 8? 2 and 4 and 6? 3 and 4 and 5? 4 and 7 and 2? 5 and 4 and 8?

7. How many are 1 and 9? 10 and 3? 4 and 9? 7 and 1? 5 and 7? 9 and 4? 2 and 12? 3 and 11? Give two numbers which, added together, make 10.

8. Begin at 4, and add 2 each time up to 16.

9. Begin at 1, and add 3 each time up to 13.

10. Mention two numbers which, added together, will make 12. Three numbers.

11. Seven and 5 and 2 are how many?

12. Seven and 3 and 4 are how many?

13. If 3 is added to 3, and that sum to 5, what will be the result?

14. If you add 3 to the sum of 3 and 1, and then add 7 more, what will be the amount?

15. There are 8 eggs in one basket, 4 in another, and 3 in another. How many eggs are there in all?

SOLUTION. — In all there are 8 eggs and 4 eggs and 3 eggs. 8 eggs and 4 eggs are 12 eggs; 12 eggs and 3 eggs are 15 eggs.

16. A little girl bought some tape for 3 cents, some pins for 5 cents, and received 2 cents in change. How many cents had she at first?

17. Two and 1 more, and 3 and 4 more, are together how many?

18. One and 3 and 4 and 5 are how many? 5 and 1 and 3 and 4?

19. A boy bought 3 cents' worth of marbles, and 2 cents' worth of candy, and received 5 cents in change. How much money did he hand the clerk?

20. I bought three hams for 8 dollars, and ten bushels of apples for 3 dollars. How much did I spend?

21. Ralph has 4 cents in one hand, 3 in the other, and 4 in his pocket. How many cents has he?

22. A tailor made two coats from 8 yards of cloth, two waistcoats from 2 yards, and two pairs of trousers from 6 yards. How many yards of cloth did he use in all?

23. A grocer sold a pound of sugar for 5 cents, some soup greens for 3 cents, and a bottle of mustard for 10 cents. How much did he receive for all?

24. How many are 9 and 3 and 2? 4 and 6 and 8? 10 and 7 and 3?

25. If I have 10 cents in one pocket, 5 cents in another, and 3 cents in each hand, how much have I all together?

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LESSON IV

ADDITION TABLE

$2 + 0 = 2$	$3 + 0 = 3$	$4 + 0 = 4$	$5 + 0 = 5$
$2 + 1 = 3$	$3 + 1 = 4$	$4 + 1 = 5$	$5 + 1 = 6$
$2 + 2 = 4$	$3 + 2 = 5$	$4 + 2 = 6$	$5 + 2 = 7$
$2 + 3 = 5$	$3 + 3 = 6$	$4 + 3 = 7$	$5 + 3 = 8$
$2 + 4 = 6$	$3 + 4 = 7$	$4 + 4 = 8$	$5 + 4 = 9$
$2 + 5 = 7$	$3 + 5 = 8$	$4 + 5 = 9$	$5 + 5 = 10$
$2 + 6 = 8$	$3 + 6 = 9$	$4 + 6 = 10$	$5 + 6 = 11$
$2 + 7 = 9$	$3 + 7 = 10$	$4 + 7 = 11$	$5 + 7 = 12$
$2 + 8 = 10$	$3 + 8 = 11$	$4 + 8 = 12$	$5 + 8 = 13$
$2 + 9 = 11$	$3 + 9 = 12$	$4 + 9 = 13$	$5 + 9 = 14$
$2 + 10 = 12$	$3 + 10 = 13$	$4 + 10 = 14$	$5 + 10 = 15$
$2 + 11 = 13$	$3 + 11 = 14$	$4 + 11 = 15$	$5 + 11 = 16$
$2 + 12 = 14$	$3 + 12 = 15$	$4 + 12 = 16$	$5 + 12 = 17$
$6 + 0 = 6$	$7 + 0 = 7$	$8 + 0 = 8$	$9 + 0 = 9$
$6 + 1 = 7$	$7 + 1 = 8$	$8 + 1 = 9$	$9 + 1 = 10$
$6 + 2 = 8$	$7 + 2 = 9$	$8 + 2 = 10$	$9 + 2 = 11$
$6 + 3 = 9$	$7 + 3 = 10$	$8 + 3 = 11$	$9 + 3 = 12$
$6 + 4 = 10$	$7 + 4 = 11$	$8 + 4 = 12$	$9 + 4 = 13$
$6 + 5 = 11$	$7 + 5 = 12$	$8 + 5 = 13$	$9 + 5 = 14$
$6 + 6 = 12$	$7 + 6 = 13$	$8 + 6 = 14$	$9 + 6 = 15$
$6 + 7 = 13$	$7 + 7 = 14$	$8 + 7 = 15$	$9 + 7 = 16$
$6 + 8 = 14$	$7 + 8 = 15$	$8 + 8 = 16$	$9 + 8 = 17$
$6 + 9 = 15$	$7 + 9 = 16$	$8 + 9 = 17$	$9 + 9 = 18$
$6 + 10 = 16$	$7 + 10 = 17$	$8 + 10 = 18$	$9 + 10 = 19$
$6 + 11 = 17$	$7 + 11 = 18$	$8 + 11 = 19$	$9 + 11 = 20$
$6 + 12 = 18$	$7 + 12 = 19$	$8 + 12 = 20$	$9 + 12 = 21$

Exercises on the Table

Read the sums :

1.	1	2	3	4	5	6	7	8	9	2	5	1	6	1	4
	1	2	3	4	5	6	7	8	9	1	6	7	3	5	5
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.	6	2	6	2	7	3	5	9	8	6	5	4	7	8	4
	4	6	1	4	2	8	9	8	7	8	7	7	9	5	8
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.	3	9	3	9	7	3	5	4	3	2	8	1	2	9	7
	1	6	4	4	3	9	3	1	2	9	2	8	5	1	6
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

LESSON V

- Three and 8 are how many? 6 and 9?
- Four and 4 are how many? 4 and 11? 4 and 10?
4 and 12?
- Five and 9 are how many? 5 and 12? 5 and 10?
5 and 8? 5 and 11? 6 and 6? 6 and 8?
- Seven and 7 are how many? 7 and 10? 7 and 8?
7 and 12? 7 and 9? 7 and 11? 8 and 8?
- Nine and 11 are how many? 9 and 9? 9 and 12?
9 and 10? 9 and 8?
- Ten and 6 are how many? 10 and 8? 10 and 10?
10 and 12? 10 and 11?
- Eleven and 2 are how many? 11 and 4? 11 and 6?
11 and 8? 11 and 3? 11 and 11?
- Twelve and 3 are how many? 12 and 4? 12 and 6?
12 and 8? 12 and 11? 12 and 12?
- Thirteen and 4 are how many? 13 and 6? 13
and 5? 13 and 7? 13 and 9? 13 and 10? 13 and 8?
13 and 11? 13 and 12?

10. Fourteen and 4 are how many? 14 and 6? 14 and 8? 14 and 5? 14 and 7? 14 and 10? 14 and 9? 14 and 11? 14 and 12?

11. Fifteen and 5 are how many? 15 and 7? 15 and 9? 15 and 4? 15 and 8? 15 and 10? 15 and 12? 15 and 11?

12. Sixteen and 4 are how many? 16 and 6? 16 and 8? 16 and 5? 16 and 7? 16 and 9? 16 and 11? 16 and 10? 16 and 12?

13. Seventeen and 6 are how many? 17 and 4? 17 and 7? 17 and 5? 17 and 9? 17 and 8? 17 and 10? 17 and 12? 17 and 11?

14. Eighteen and 10 are how many? 18 and 4? 18 and 7? 18 and 5? 18 and 8? 18 and 6? 18 and 9? 18 and 11? 18 and 12?

15. Nineteen and 5 are how many? 19 and 3? 19 and 2? 19 and 7? 19 and 9? 19 and 8? 19 and 10? 19 and 6? 19 and 12? 19 and 11?

LESSON VI

1. How many are 29 and 2? 49 and 2? 69 and 2? 39 and 2? 59 and 2? 79 and 2? 99 and 2?

2. How many are 29 and 3? 3 and 49? 59 and 3? 3 and 39? 69 and 3? 3 and 79? 3 and 89? 99 and 3?

3. How many are 29 and 7? 7 and 49? 39 and 7? 7 and 59? 79 and 7? 7 and 69? 89 and 7? 7 and 99?

4. How many are 29 and 8? 49 and 8? 39 and 8? 8 and 69? 59 and 8? 79 and 8? 89 and 8?

5. How many are 19 and 9? 9 and 29? 49 and 9? 69 and 9? 59 and 9? 79 and 9? 89 and 9? 9 and 99?

6. How many are 28 and 3? 48 and 3? 68 and 3?

7. How many are 28 and 7? 7 and 38? 48 and 7? 68 and 7? 58 and 7? 88 and 7? 78 and 7?

8. How many are 17 and 7? 27 and 7? 47 and 7?
57 and 7? 37 and 7? 67 and 7? 87 and 7? 77 and 7?
97 and 7?

9. How many are 27 and 10? 47 and 10? 37 and
10? 57 and 10? 67 and 10? 77 and 10?

10. How many are 15 and 6? 26 and 6? 35 and 6?
24 and 6? 46 and 6? 36 and 6? 48 and 6? 45
and 6? 57 and 6? 59 and 6? 66 and 6? 75 and 6?

11. How many are 17 and 3? 23 and 8? 24 and 8?
33 and 8? 3 and 37? 8 and 43? 47 and 3? 7 and 53?

12. How many are 9 and 24? 25 and 9? 9 and 34?
9 and 44? 9 and 47? 54 and 9? 9 and 56? 9 and 64?
74 and 9? 9 and 72? 84 and 9? 86 and 9? 94 and 9?

13. How many are 6 and 21? 10 and 26? 46 and 10?
10 and 35? 10 and 55? 56 and 10? 10 and 66? 10
and 69? 76 and 10? 10 and 86? 96 and 10?

14. How many are 11 and 16? 11 and 27? 25 and
11? 11 and 23? 31 and 11? 11 and 35? 37 and 11?
11 and 59? 46 and 11? 11 and 48? 52 and 11?

LESSON VII

Find the sums:

1. $1 + 4$	$11 + 8$	$21 + 3$	$31 + 2$	$41 + 1$
2. $51 + 7$	$61 + 8$	$71 + 9$	$81 + 6$	$91 + 5$
3. $2 + 1$	$22 + 3$	$32 + 2$	$12 + 5$	$52 + 4$
4. $62 + 8$	$42 + 9$	$72 + 6$	$92 + 7$	$82 + 6$
5. $3 + 1$	$13 + 2$	$53 + 3$	$23 + 4$	$43 + 5$
6. $33 + 6$	$73 + 7$	$63 + 8$	$93 + 9$	$83 + 7$
7. $4 + 5$	$84 + 6$	$14 + 1$	$44 + 8$	$24 + 9$
8. $34 + 2$	$94 + 3$	$54 + 4$	$64 + 7$	$74 + 8$
9. $8 + 4$	$78 + 5$	$28 + 6$	$38 + 7$	$58 + 8$
10. $48 + 2$	$18 + 3$	$68 + 8$	$98 + 1$	$88 + 9$

11.	$9 + 1$	$69 + 2$	$79 + 7$	$99 + 3$	$89 + 9$
12.	$59 + 8$	$49 + 4$	$39 + 5$	$29 + 6$	$19 + 1$
13.	$5 + 8$	$55 + 6$	$15 + 7$	$45 + 9$	$25 + 5$
14.	$35 + 4$	$65 + 3$	$75 + 1$	$85 + 2$	$95 + 9$
15.	$7 + 9$	$47 + 5$	$57 + 1$	$87 + 8$	$67 + 7$
16.	$97 + 6$	$77 + 2$	$17 + 4$	$27 + 3$	$37 + 8$
17.	$6 + 7$	$86 + 4$	$46 + 3$	$66 + 2$	$56 + 5$
18.	$36 + 1$	$16 + 6$	$96 + 8$	$26 + 9$	$76 + 7$
19.	$0 + 7$	$10 + 3$	$40 + 4$	$30 + 5$	$50 + 6$
20.	$70 + 8$	$80 + 9$	$60 + 2$	$20 + 6$	$90 + 1$

A	0	10	20	30	40	50	60	70	80	90
B	1	11	21	31	41	51	61	71	81	91
C	2	12	22	32	42	52	62	72	82	92
D	3	13	23	33	43	53	63	73	83	93
E	4	14	24	34	44	54	64	74	84	94
F	5	15	25	35	45	55	65	75	85	95
G	6	16	26	36	46	56	66	76	86	96
H	7	17	27	37	47	57	67	77	87	97
I	8	18	28	38	48	58	68	78	88	98
J	9	19	29	39	49	59	69	79	89	99

21. Add 2 to each number in A. Add 3, 4, 5, 6, 7, 8, 9.
 22. Add 2 to each number in B. Add 3, 4, 5, 6, 7, 8, 9.
 23. Add 2 to each number in C. Add 3, 4, 5, 6, 7, 8, 9.
 24. Add 2 to each number in D. Add 3, 4, 5, 6, 7, 8, 9.
 25. Add 2 to each number in E. Add 3, 4, 5, 6, 7, 8, 9.
 26. Add 2 to each number in F. Add 3, 4, 5, 6, 7, 8, 9.
 27. Add 2 to each number in G. Add 3, 4, 5, 6, 7, 8, 9.
 28. Add 2 to each number in H. Add 3, 4, 5, 6, 7, 8, 9.
 29. Add 2 to each number in I. Add 3, 4, 5, 6, 7, 8, 9.
 30. Add 2 to each number in J. Add 3, 4, 5, 6, 7, 8, 9.

LESSON VIII

1. Three and 6 and 4 are how many?

SOLUTION. — Three and six are nine, and four are thirteen.

2. Four and 5 and 7 are how many?

3. Five and 6 and 2 are how many?

Add:

- | | |
|-----------------------------|-----------------------------|
| 4. $8 + 3 + 5 + 2 + 6 + 3$ | 11. $5 + 7 + 2 + 3 + 4 + 6$ |
| 5. $2 + 4 + 3 + 5 + 6 + 2$ | 12. $3 + 2 + 4 + 5 + 4 + 6$ |
| 6. $4 + 3 + 5 + 7 + 6 + 8$ | 13. $4 + 9 + 3 + 5 + 6 + 7$ |
| 7. $5 + 8 + 8 + 5 + 8 + 5$ | 14. $6 + 8 + 7 + 3 + 5 + 4$ |
| 8. $7 + 9 + 5 + 4 + 6 + 3$ | 15. $8 + 7 + 6 + 5 + 4 + 3$ |
| 9. $9 + 6 + 7 + 4 + 5 + 3$ | 16. $7 + 6 + 5 + 8 + 7 + 9$ |
| 10. $9 + 8 + 7 + 5 + 8 + 9$ | 17. $9 + 8 + 7 + 6 + 5 + 4$ |

Add:

- | | | |
|-------------------|-------------------|----------------------|
| 18. $12 + 11 + 8$ | 25. $14 + 16 + 7$ | 32. $15 + 3 + 4 + 2$ |
| 19. $16 + 15 + 9$ | 26. $24 + 15 + 8$ | 33. $26 + 4 + 3 + 2$ |
| 20. $13 + 14 + 3$ | 27. $38 + 18 + 9$ | 34. $37 + 6 + 2 + 3$ |
| 21. $18 + 19 + 7$ | 28. $48 + 19 + 6$ | 35. $48 + 7 + 1 + 4$ |
| 22. $15 + 18 + 6$ | 29. $59 + 17 + 5$ | 36. $59 + 5 + 9 + 9$ |
| 23. $14 + 13 + 9$ | 30. $67 + 16 + 4$ | 37. $60 + 8 + 8 + 8$ |
| 24. $17 + 17 + 4$ | 31. $76 + 13 + 3$ | 38. $71 + 9 + 7 + 6$ |

Add the following columns rapidly downward and across:

- | | a | b | c | d | e | f | g | h | i | j |
|-----|---|---|---|---|---|---|---|---|---|---|
| 39. | 7 | 8 | 6 | 9 | 2 | 7 | 8 | 9 | 8 | 1 |
| 40. | 9 | 5 | 1 | 6 | 8 | 1 | 4 | 3 | 5 | 9 |
| 41. | 8 | 6 | 9 | 9 | 7 | 8 | 4 | 3 | 2 | 8 |
| 42. | 6 | 7 | 3 | 8 | 8 | 5 | 6 | 7 | 8 | 9 |
| 43. | 5 | 9 | 4 | 2 | 7 | 1 | 7 | 8 | 9 | 6 |
| 44. | 4 | 8 | 6 | 3 | 6 | 7 | 8 | 9 | 7 | 5 |
| 45. | 0 | 4 | 8 | 4 | 2 | 9 | 5 | 5 | 9 | 7 |

LESSON IX

1. Alfred spent 7 cents for apples, 5 cents for peaches, and 3 cents for an orange. How many cents did he spend?

SOLUTION.—He spent 7 cents, 5 cents, and 3 cents, which are 15 cents.

2. Seven dollars and 6 dollars and 4 dollars are how many dollars?

3. There were 9 passengers in a car; 5 got in at one corner and 2 at the next. How many passengers were then in the car?

4. Arnold had 11 books. He bought 7 more, and his brother gave him 5. How many had he then?

5. A man paid 13 dollars for a cart, 9 dollars for a plow, and 1 dollar for a rake. How much did he spend?

6. Edward has 8 marbles in one pocket, 5 in another, 6 in another, and 7 in another. How many has he in all?

7. If a dozen eggs cost 18 cents, and a pound of dates 10 cents, how much will both cost?

8. A man owes to one person 8 dollars, to another 5 dollars, to another 3 dollars, and to another 7 dollars. How much does he owe?

9. A boy paid 19 cents for a spelling book, 8 cents for a pad, and 6 cents for pencils. How many cents did he spend?

10. A man bought horses as follows: Of one man 17, of another 9, of another 7, of another 8. How many did he buy?

11. A man bought on account a vest for 7 dollars, a coat for 10 dollars, an umbrella for 9 dollars, and a pair of trousers for 8 dollars. What was the amount of his bill?

12. It is 8 miles from Coy to Lee, 5 miles from Lee to Ayr, and as far from Ayr to Salem as from Coy to Ayr. How far is it from Coy to Salem?

13. Begin with 2, and count one hundred by adding 2 successively. Thus, 2, 4, 6, 8, 10, and so on.

14. Begin with 3, and count ninety-nine by adding 3 successively. Thus, 3, 6, 9, 12, and so on.

15. Begin with 4, and count one hundred by adding 4 successively.

16. Begin with 5, and count one hundred by adding 5 successively.

17. Begin with 6, and count one hundred two by adding 6 successively.

18. Begin with 7, and count ninety-eight by adding 7 successively.

19. Begin with 8, and count one hundred four by adding 8 successively.

20. Begin with 9, and count ninety-nine by adding 9 successively.

21. Begin with 1, and count one hundred by adding 3 successively.

22. Begin with 3, and count one hundred three by adding 4 successively.

23. Begin with 2, and count one hundred two by adding 5 successively.

24. Begin with 5, and count one hundred seven by adding 6 successively.

25. Begin with 6, and count one hundred four by adding 7 successively.

26. Begin with 7, and count one hundred three by adding 8 successively.

27. Begin with 8, and count one hundred seven by adding 9 successively.

28. Begin with 6, and count one hundred five by adding 9 successively.

SUBTRACTION

LESSON X

1. There were 2 birds on a telegraph wire and 1 flew away. How many birds were left? *Ans.* 1 bird.

Why? *Ans.* Because 1 from 2 leaves 1.

2. Grace had 3 dolls and sent 1 to a child in a hospital. How many had she left? *Ans.* 2 dolls.

Why? *Ans.* Because 1 from 3 leaves 2.

3. Edith is 4 years old and her baby brother is 1 year old. How much older is Edith than the baby?

4. One from 5 leaves how many? One from 6? From 7? From 8? From 9? From 10?

5. A boy has 6 miles to travel and has gone 2 miles. How much farther must he travel?

6. Kate spent 2 cents out of a nickel. How much had she left?

7. Two from 6 leaves how many? From 7? From 8? From 9? From 10? From 11?

8. A man gained \$3 by selling a hat for \$5? What was the cost?

9. Three from 6 leaves how many? From 7? From 8? From 9? From 10? From 11? From 12?

10. Alice had 9 pencils and lost 4. How many pencils had she left?

11. Four from 10 leaves how many? From 11? From 12? From 13? From 14? From 15?

12. There were 10 passengers in a car and 5 got out. How many passengers were left?

13. Five from 11 leaves how many? From 12? From 13? From 14? From 15? From 16?

14. George had 11 marbles and lost 6. How many marbles had he left?

15. Six from 12 leaves how many? From 13? From 14? From 15? From 16? From 17?

16. Dora had 12 cents and lost 7. How many cents had she left?

17. Seven from 13 leaves how many? From 14? From 15? From 16? From 17? From 18? From 19?

18. What must be added to 8 to make 13?

19. Eight from 14 leaves how many? From 15? From 16? From 17? From 18? From 19? From 20?

20. The distance from my house to Eva's is 13 blocks, and from my house to Maud's in the same direction 9 blocks. How far is it from Maud's house to Eva's?

21. Nine from 14 leaves how many? From 15? From 16? From 17? From 18? From 19? From 20?

22. Frank had 17 cents and spent a nickel. How many cents had he remaining?

23. Mary is 12 years old, and Anna is 8. How much older is Mary than Anna?

24. I have 17 miles to travel. After going 6 miles, how much farther must I go?

25. A boy had 18 marbles and lost 10. How many had he then?

Subtraction is the process of finding the *difference* between two numbers.

The larger number is called the **minuend**; the smaller number, the **subtrahend**; and the result, the **difference** or **remainder**.

The sign of subtraction (—) is called **minus**.

LESSON XI

SUBTRACTION TABLE

$2-2=0$	$3-3=0$	$4-4=0$	$5-5=0$
$3-2=1$	$4-3=1$	$5-4=1$	$6-5=1$
$4-2=2$	$5-3=2$	$6-4=2$	$7-5=2$
$5-2=3$	$6-3=3$	$7-4=3$	$8-5=3$
$6-2=4$	$7-3=4$	$8-4=4$	$9-5=4$
$7-2=5$	$8-3=5$	$9-4=5$	$10-5=5$
$8-2=6$	$9-3=6$	$10-4=6$	$11-5=6$
$9-2=7$	$10-3=7$	$11-4=7$	$12-5=7$
$10-2=8$	$11-3=8$	$12-4=8$	$13-5=8$
$11-2=9$	$12-3=9$	$13-4=9$	$14-5=9$
$12-2=10$	$13-3=10$	$14-4=10$	$15-5=10$
$13-2=11$	$14-3=11$	$15-4=11$	$16-5=11$
$14-2=12$	$15-3=12$	$16-4=12$	$17-5=12$
$6-6=0$	$7-7=0$	$8-8=0$	$9-9=0$
$7-6=1$	$8-7=1$	$9-8=1$	$10-9=1$
$8-6=2$	$9-7=2$	$10-8=2$	$11-9=2$
$9-6=3$	$10-7=3$	$11-8=3$	$12-9=3$
$10-6=4$	$11-7=4$	$12-8=4$	$13-9=4$
$11-6=5$	$12-7=5$	$13-8=5$	$14-9=5$
$12-6=6$	$13-7=6$	$14-8=6$	$15-9=6$
$13-6=7$	$14-7=7$	$15-8=7$	$16-9=7$
$14-6=8$	$15-7=8$	$16-8=8$	$17-9=8$
$15-6=9$	$16-7=9$	$17-8=9$	$18-9=9$
$16-6=10$	$17-7=10$	$18-8=10$	$19-9=10$
$17-6=11$	$18-7=11$	$19-8=11$	$20-9=11$
$18-6=12$	$19-7=12$	$20-8=12$	$21-9=12$

Exercises on the Table

Find the remainders at sight :

1. $\begin{array}{r} 5 \ 3 \ 9 \ 8 \ 7 \ 6 \ 7 \ 5 \ 3 \ 9 \ 8 \ 7 \ 6 \ 5 \ 5 \ 9 \ 8 \ 9 \ 9 \\ 3 \ 2 \ 8 \ 1 \ 6 \ 5 \ 5 \ 4 \ 1 \ 7 \ 2 \ 4 \ 4 \ 2 \ 1 \ 3 \ 7 \ 2 \ 1 \\ \hline \end{array}$
2. $\begin{array}{r} 4 \ 9 \ 8 \ 7 \ 6 \ 4 \ 9 \ 8 \ 7 \ 6 \ 9 \ 8 \ 7 \ 6 \ 4 \ 8 \ 15 \ 16 \\ 3 \ 6 \ 3 \ 3 \ 2 \ 2 \ 5 \ 4 \ 2 \ 3 \ 4 \ 5 \ 1 \ 1 \ 1 \ 6 \ 8 \ 9 \\ \hline \end{array}$
3. $\begin{array}{r} 10 \ 12 \ 11 \ 12 \ 13 \ 12 \ 11 \ 12 \ 13 \ 11 \ 11 \ 13 \ 12 \ 11 \ 13 \\ 9 \ 4 \ 5 \ 3 \ 9 \ 7 \ 7 \ 6 \ 5 \ 6 \ 2 \ 8 \ 5 \ 8 \ 4 \\ \hline \end{array}$
4. $\begin{array}{r} 12 \ 11 \ 13 \ 12 \ 10 \ 18 \ 16 \ 17 \ 10 \ 17 \ 16 \ 15 \ 14 \ 10 \\ 9 \ 9 \ 6 \ 8 \ 7 \ 9 \ 7 \ 8 \ 2 \ 9 \ 8 \ 6 \ 9 \ 3 \\ \hline \end{array}$
5. $\begin{array}{r} 11 \ 10 \ 14 \ 11 \ 10 \ 14 \ 15 \ 10 \ 14 \ 10 \ 14 \ 15 \ 10 \ 13 \\ 4 \ 1 \ 8 \ 3 \ 6 \ 6 \ 7 \ 5 \ 7 \ 4 \ 5 \ 9 \ 8 \ 7 \\ \hline \end{array}$

What must be added to :

6. 9 to make 18? 17? 16? 15? 14? 13? 12? 11?
7. 8 to make 17? 16? 15? 14? 13? 12? 11? 10?
8. 7 to make 16? 15? 14? 13? 12? 11? 10? 9?
9. 6 to make 15? 14? 13? 12? 11? 10? 9? 8?
10. 5 to make 14? 13? 12? 11? 10? 9? 8? 7?
11. 4 to make 13? 12? 11? 10? 9? 8? 7? 6?
12. 3 to make 12? 11? 10? 9? 8? 7? 6? 5?
13. 2 to make 11? 10? 9? 8? 7? 6? 5? 4?
14. $10 - ? = 4$ $? + 5 = 8$ $? - 2 = 9$ $? + 6 = 12$
15. $8 - ? = 5$ $? + 6 = 10$ $? - 5 = 8$ $9 - ? = 2$
16. $9 - ? = 6$ $? + 7 = 12$ $? - 8 = 5$ $? - 1 = 8$

LESSON XII

1. Out of 9 days' vacation a week of 7 days has passed. How many days are left?

SOLUTION. — There are left the difference between 9 days and 7 days, which are 2 days.

2. A man, having 16 dollars, spent 12 dollars. How many dollars had he left?

3. A boy bought a ball for 12 cents, and a top for 7 cents. How much did the ball cost more than the top?

4. Fred is 18 years old. How much older is he than his brother, who is 9?

5. Ruth bought a blankbook for 14 cents, and gave the clerk 20 cents. How much change did he return?

6. Robert has 19 chestnuts in his two pockets. In one pocket he has 15. How many are there in the other?

7. A man has 25 miles to travel. When he has gone 19 miles, how far will he still have to travel?

8. A boy paid 24 cents for a book, and sold it for 16 cents. How much did he lose?

9. How much is gained by buying butter for 19 cents a pound and selling it for 24 cents a pound?

10. In a car that is carrying 27 passengers, 19 are seated. How many are standing?

11. A man, owing 26 dollars, paid 18 dollars. How many did he still owe?

12. John had 26 cents given him by William and Thomas. William gave him 17 cents. How many did Thomas give? How many more did William give than Thomas?

SOLUTION. — Thomas gave him 26 cents less 17 cents, which are 9 cents; William gave more than Thomas 17 cents less 9 cents, which are 8 cents.

13. If a boy had 10 apples, and gave 2 to John and 6 to Anna, how many would he have left?

14. Charles had 36 cents, and earned enough more to make 40 cents. How much did he earn?

15. George had 40 marbles; he lost 20. How many did he then have?

16. Of 100 copies of a newspaper printed on an ocean steamship, how many were left when 50 were sold?

17. A farmer had 35 bushels of grain. A part having been wasted, he found there were but 22 bushels remaining. How much was wasted?

18. Albert's father is 36 years old; Albert is 12. How many years older than Albert is his father?

19. I had 65 cents; I spent 20 cents for a book and 10 cents for a pad. How much had I left?

20. If you take 10 from the sum of two numbers, there will be 8 left. What is their sum?

21. If you take 16 from the difference between two numbers, there will remain 12. What is their difference?

22. The sum of two numbers is 20. What number must be added to make their sum 30?

23. The sum of two numbers is 16 more than their difference; if their difference is 4, what is their sum?

24. The greater of two numbers is 12, and their difference 5. What is the less?

25. The sum of two numbers is 21; the less number is 8. What is the greater?

26. If you take 18 from the difference between two numbers, the remainder will be 10. What is their difference?

27. The greater of two numbers is 15 and their difference 8. What is the less?

28. The sum of two numbers is 56; the less number is 10. What is the greater?

LESSON XIII

A	10	20	30	40	50	60	70	80	90
B	11	21	31	41	51	61	71	81	91
C	12	22	32	42	52	62	72	82	92
D	13	23	33	43	53	63	73	83	93
E	14	24	34	44	54	64	74	84	94
F	15	25	35	45	55	65	75	85	95
G	16	26	36	46	56	66	76	86	96
H	17	27	37	47	57	67	77	87	97
I	18	28	38	48	58	68	78	88	98
J	19	29	39	49	59	69	79	89	99

1. Take 2 from each number in A. Take 3, 4, 5, 6, 7, 8, 9.
2. Take 2 from each number in B. Take 3, 4, 5, 6, 7, 8, 9
3. Take 2 from each number in C. Take 3, 4, 5, 6, 7, 8, 9
4. Take first 2, then 3, 4, 5, 6, 7, 8, 9, from each number in D. In E. In F. In G. In H. In I. In J.

REVIEW

LESSON XIV.

1. Edgar had 13 marbles. He gave 2 to Henry, and 3 to Thomas. How many had he left?

SOLUTION. — Edgar gave away 2 marbles and 3 marbles, which are 5 marbles; he had left 13 marbles less 5 marbles, which are 8 marbles.

2. A man had 40 barrels of flour; he sold to one man 8 barrels, to another 21 barrels. How many had he left?

3. On Christmas day, William had 36 cents given him; he spent 6 cents for apples, 9 cents for cakes, and 10 cents for candy. How many cents had he left?

4. A man paid 30 dollars for a horse, the keeping cost 9 dollars, and he sold him for 29 dollars. How many dollars did he lose?

5. I owed 34 dollars, but paid 15 dollars one day and 10 dollars another day. How much did I still owe?

6. A grocer bought some oranges for 9 dollars, some lemons for 7 dollars, some prunes for 5 dollars, and some figs for 9 dollars. He sold them all for 41 dollars. How much did he gain?

7. A lady bought a comb for 25 cents, some pins for 10 cents, tape for 7 cents, thread for 6 cents, and a toy for 5 cents. She gave 60 cents to the shopkeeper. How much change ought she to receive?

8. Two boys commenced playing marbles; each had 18 when they began. When they stopped playing, one had 25. How many had the other?

SOLUTION. — When they began, both had 18 marbles and 18 marbles, which are 36 marbles; hence, when they finished, the other had 36 marbles less 25 marbles, which are 11 marbles.

9. There are 7 pictures on the south wall of my room, 5 on the north wall, and 11 on the east wall. How many more are there on the south and east walls together than on the north wall?

10. Three boys played marbles. Frank had 20, Richard 10, and John 4; when they stopped, Richard had 6 and John 12. How many had Frank?

11. The sum of four numbers is 24, and the first three are 9, 5, and 6. What is the fourth?

12. A grocer bought sugar for 12 dollars, flour for 6 dollars, and coffee for 5 dollars; he sold the whole for 30 dollars. How much did he make?

13. A lady had 50 cents; she spent 25 cents for butter, and 10 cents for eggs. How much had she left?

14. How many are 90 less 35, less 25, less 15?

LESSON XV

1. $3 - 2 + 1 = ?$

SOLUTION.—3 minus 2 plus 1 equals 2.

2. $4 - 3 + 2 = ?$

3. $6 - 5 + 4 = ?$

4. $8 - 7 + 6 = ?$

5. $7 - 3 + 5 = ?$

6. $9 - 4 + 7 = ?$

7. $4 - 3 + 2 = ?$

8. $6 - 5 + 4 = ?$

9. $8 - 4 + 6 = ?$

10. $8 + 2 - 3 = ?$

11. $7 + 3 - 4 = ?$

12. $6 + 5 - 8 = ?$

13. $4 + 7 - 9 = ?$

14. $3 + 8 - 6 = ?$

15. $5 + 9 - 7 = ?$

16. $9 + 6 - 5 = ?$

17. $8 + 4 - 3 = ?$

18. $9 - 5 + 7 - 2 + 2 = ?$

19. $9 - 4 + 3 - 2 + 1 = ?$

20. $8 - 5 + 4 - 3 + 2 = ?$

21. $7 - 3 + 5 - 4 + 3 = ?$

22. $8 - 2 + 6 - 5 + 4 = ?$

23. $9 - 5 + 7 - 6 + 5 = ?$

24. $6 - 2 + 4 - 3 + 2 - 1 = ?$

25. $7 - 4 + 5 - 4 + 3 - 2 = ?$

26. $8 - 5 + 6 - 5 + 4 - 3 = ?$

27. $9 - 6 + 7 - 6 + 5 - 4 = ?$

28. $7 - 6 + 5 - 4 + 3 - 2 + 1 = ?$

29. $8 - 6 + 6 - 5 + 4 - 3 + 2 - 1 = ?$

30. $9 - 5 + 7 - 6 + 5 - 4 + 3 - 2 + 1 = ?$

31. $1 + 2 + 3 - 4 + 5 - 6 + 7 - 5 + 9 = ?$

32. $9 - 1 - 2 - 3 + 4 - 5 + 6 - 4 + 8 = ?$

33. $1 + 9 - 2 - 3 + 3 + 7 - 6 - 4 + 5 = ?$

34. $9 - 7 + 8 - 5 + 6 - 3 + 4 - 2 + 1 - 10 = ?$

35. $1 + 3 - 2 + 4 - 5 + 7 - 6 + 8 - 9 + 10 = ?$

LESSON XVI

1. While playing ball Frank broke a glass worth 24 cents. He has 15 cents. How much more must he get to pay for it?

2. The sum of three numbers is 27. The first two are 10 and 9. What is the third?

3. If from 20 you take 12 less 3, how many will remain?

4. If from the sum of 19 and 10 you take the difference between 17 and 10, what will be left?

SOLUTION. — 19 plus 10 equals 29; 17 minus 10 equals 7; 29 minus 7 equals 22.

5. A man owed 60 dollars. He paid at one time 20 dollars, and at another 30 dollars; he afterwards borrowed 5 dollars. How much does he still owe?

6. A man paid 38 dollars for a horse, and 20 dollars for a colt. He afterwards sold the colt for 10 dollars, and the horse for 65 dollars. How much did he make by the transaction?

7. Twenty-four less 8, and 12 less 5, are together how much less than 25?

8. A man engaged to do a piece of work for 60 dollars. He had an assistant 25 days at a dollar a day, and paid 20 dollars for materials. How much did he earn?

9. If from the sum of 8 and 9 and 10 and 11, you take the sum of 4 and 5 and 6 and 7, how much shall you have remaining?

10. A jeweler bought a watch for 40 dollars, a chain for 15 dollars, and a charm for 3 dollars. He sold them for 63 dollars. How much did he gain?

11. A drover bought sheep as follows: of one man, 10; of another, 12; of another, 5; of another, 3. He sold at one time, 15; and at another, 5. How many were left?

12. A man, having 40 dollars, purchased a suit of clothes. His trousers cost 7 dollars; vest, 5 dollars; coat, 25 dollars. How much had he left?

13. What number must be added to 25 to make a sum 14 less than 45?

14. What number must be taken from 62 to give a result which shall be 12 more than 45?

15. If from the sum of 25 and 10 and 12, you take the difference between 28 and 19, what will remain?

16. A man bought a horse for 40 dollars. After paying 15 dollars for keeping him, he sold him for 75 dollars. How much did he make?

17. A man engaged in trade with 75 dollars. After losing at one time 10 dollars, and at another 5 dollars, he gained 20 dollars. How much did he then have?

18. The difference between two numbers is 17. The greater number is 85. What is the less?

19. John and James entered into partnership in business, with a joint capital of 100 dollars. John furnished 60 dollars of the money. What was James's share?

20. A barrel contained 30 gallons of sirup. Of this, 14 gallons were sold, 5 gallons leaked out, and 3 gallons were given away. How much sirup remained in the barrel?

21. An orchard contains, in one row, 5 apple trees and 15 peach trees; in another row, 11 apple trees and 9 peach trees; and in another, 10 trees of each kind. How many more peach trees are there in the orchard than apple trees?

22. How many are 87 less 14, less 21, less 51?

23. How many are 100 less 15, less 14, less 10?

24. How many are 95 less 20, less 30, less 40?

MULTIPLICATION

LESSON XVII

1. A boy paid 2 cents for one stamp, and 2 cents for another. How many cents did he pay for both? *Ans.* 4 cents.

Why? *Ans.* Because 2 times 2 are 4.

2. There are 3 windows on one side of a room and 3 on another. How many are there on both sides?

3. At 4 cents apiece, how much will 2 roses cost?

4. At 3 cents apiece, how much will 3 peaches cost?

5. At 3 cents apiece, how much will 4 boxes cost?

6. At 3 cents apiece, how much will 5 cakes cost?

7. At 4 cents apiece, how much will 4 lemons cost?

8. At 5 dollars a yard, how much will 4 yards of cloth cost?

9. At 6 dollars each, how much will 4 tables cost?

10. At 5 cents apiece, how much will 5 oranges cost?

11. At 6 cents a yard, how much will 5 yards of ribbon cost?

12. At 6 cents apiece, how much will 6 oranges cost?

13. At 7 cents a yard, how much will 2 yards of calico cost?

14. At 7 cents apiece, how much will 3 papers cost?

15. At 7 cents apiece, how much will 4 toys cost?

16. There are 7 days in a week. How many days are there in 5 weeks?

17. In one peck there are 8 quarts. How many quarts are there in 2 pecks?

18. An octagon is an 8-sided figure. How many sides have 3 octagons? 4 octagons?

19. How many panes of glass are there in 5 windows, each containing 8 panes?

20. At 9 cents a yard, how much will 2 yards of ribbon cost? 3 yards?

21. How much will 4 quarts of nuts cost, at 10 cents a quart?

22. How much will 3 yards of muslin cost, at 11 cents a yard?

Multiplication is taking one number as many times as there are units in another.

The **multiplicand** is the number to be taken. The **multiplier** is the number denoting how many times the multiplicand is to be taken. The **product** is the result.

The sign of multiplication (\times) is read *multiplied by*.

LESSON XVIII

MULTIPLICATION TABLE

$1 \times 1 = 1$	$1 \times 2 = 2$	$1 \times 3 = 3$	$1 \times 4 = 4$
$2 \times 1 = 2$	$2 \times 2 = 4$	$2 \times 3 = 6$	$2 \times 4 = 8$
$3 \times 1 = 3$	$3 \times 2 = 6$	$3 \times 3 = 9$	$3 \times 4 = 12$
$4 \times 1 = 4$	$4 \times 2 = 8$	$4 \times 3 = 12$	$4 \times 4 = 16$
$5 \times 1 = 5$	$5 \times 2 = 10$	$5 \times 3 = 15$	$5 \times 4 = 20$
$6 \times 1 = 6$	$6 \times 2 = 12$	$6 \times 3 = 18$	$6 \times 4 = 24$
$7 \times 1 = 7$	$7 \times 2 = 14$	$7 \times 3 = 21$	$7 \times 4 = 28$
$8 \times 1 = 8$	$8 \times 2 = 16$	$8 \times 3 = 24$	$8 \times 4 = 32$
$9 \times 1 = 9$	$9 \times 2 = 18$	$9 \times 3 = 27$	$9 \times 4 = 36$
$10 \times 1 = 10$	$10 \times 2 = 20$	$10 \times 3 = 30$	$10 \times 4 = 40$
$11 \times 1 = 11$	$11 \times 2 = 22$	$11 \times 3 = 33$	$11 \times 4 = 44$
$12 \times 1 = 12$	$12 \times 2 = 24$	$12 \times 3 = 36$	$12 \times 4 = 48$

$1 \times 5 = 5$	$1 \times 6 = 6$	$1 \times 7 = 7$	$1 \times 8 = 8$
$2 \times 5 = 10$	$2 \times 6 = 12$	$2 \times 7 = 14$	$2 \times 8 = 16$
$3 \times 5 = 15$	$3 \times 6 = 18$	$3 \times 7 = 21$	$3 \times 8 = 24$
$4 \times 5 = 20$	$4 \times 6 = 24$	$4 \times 7 = 28$	$4 \times 8 = 32$
$5 \times 5 = 25$	$5 \times 6 = 30$	$5 \times 7 = 35$	$5 \times 8 = 40$
$6 \times 5 = 30$	$6 \times 6 = 36$	$6 \times 7 = 42$	$6 \times 8 = 48$
$7 \times 5 = 35$	$7 \times 6 = 42$	$7 \times 7 = 49$	$7 \times 8 = 56$
$8 \times 5 = 40$	$8 \times 6 = 48$	$8 \times 7 = 56$	$8 \times 8 = 64$
$9 \times 5 = 45$	$9 \times 6 = 54$	$9 \times 7 = 63$	$9 \times 8 = 72$
$10 \times 5 = 50$	$10 \times 6 = 60$	$10 \times 7 = 70$	$10 \times 8 = 80$
$11 \times 5 = 55$	$11 \times 6 = 66$	$11 \times 7 = 77$	$11 \times 8 = 88$
$12 \times 5 = 60$	$12 \times 6 = 72$	$12 \times 7 = 84$	$12 \times 8 = 96$
$1 \times 9 = 9$	$1 \times 10 = 10$	$1 \times 11 = 11$	$1 \times 12 = 12$
$2 \times 9 = 18$	$2 \times 10 = 20$	$2 \times 11 = 22$	$2 \times 12 = 24$
$3 \times 9 = 27$	$3 \times 10 = 30$	$3 \times 11 = 33$	$3 \times 12 = 36$
$4 \times 9 = 36$	$4 \times 10 = 40$	$4 \times 11 = 44$	$4 \times 12 = 48$
$5 \times 9 = 45$	$5 \times 10 = 50$	$5 \times 11 = 55$	$5 \times 12 = 60$
$6 \times 9 = 54$	$6 \times 10 = 60$	$6 \times 11 = 66$	$6 \times 12 = 72$
$7 \times 9 = 63$	$7 \times 10 = 70$	$7 \times 11 = 77$	$7 \times 12 = 84$
$8 \times 9 = 72$	$8 \times 10 = 80$	$8 \times 11 = 88$	$8 \times 12 = 96$
$9 \times 9 = 81$	$9 \times 10 = 90$	$9 \times 11 = 99$	$9 \times 12 = 108$
$10 \times 9 = 90$	$10 \times 10 = 100$	$10 \times 11 = 110$	$10 \times 12 = 120$
$11 \times 9 = 99$	$11 \times 10 = 110$	$11 \times 11 = 121$	$11 \times 12 = 132$
$12 \times 9 = 108$	$12 \times 10 = 120$	$12 \times 11 = 132$	$12 \times 12 = 144$

Exercises on the Table

Find the product :

1. By 2: Of 2. Of 3. Of 9. Of 6. Of 8. Of 7.
Of 12. Of 5. Of 4. Of 10. Of 11.

2. By 3: Of 3. Of 8. Of 7. Of 6. Of 2. Of 4.
Of 5. Of 10. Of 11. Of 9. Of 12.

3. By 6: Of 8. Of 9. Of 2. Of 7. Of 6. Of 3.
Of 5. Of 4. Of 11. Of 12. Of 10.

4. By 8: Of 9. Of 2. Of 8. Of 3. Of 7. Of 4.
Of 6. Of 10. Of 5. Of 12. Of 11.

5. By 9 : Of 5. Of 4. Of 11. Of 6. Of 3. Of 7.
Of 2. Of 8. Of 9. Of 12. Of 10.

6. By 5 : Of 7. Of 9. Of 8. Of 2. Of 3. Of 4.
Of 5. Of 6. Of 10. Of 11. Of 12.

7. By 4 : Of 6. Of 8. Of 7. Of 9. Of 3. Of 2.
Of 4. Of 11. Of 5. Of 10. Of 12.

8. By 7 : Of 4. Of 3. Of 2. Of 5. Of 9. Of 11.
Of 12. Of 7. Of 6. Of 8. Of 10.

9. By 10 : Of 2. Of 6. Of 3. Of 9. Of 4. Of 8.
Of 5. Of 7. Of 12. Of 11. Of 10.

10. By 11 : Of 9. Of 3. Of 6. Of 8. Of 5. Of 7.
Of 4. Of 12. Of 2. Of 10. Of 11.

11. By 12 : Of 12. Of 8. Of 9. Of 7. Of 2. Of 6.
Of 3. Of 4. Of 10. Of 5. Of 11.

12. $4 \times 7 = ?$ SOLUTION. — 4 times 7 are 28.

13. $8 \times 2 = ?$ $7 \times 5 = ?$ $6 \times 7 = ?$ $8 \times 6 = ?$

14. $6 \times 9 = ?$ $9 \times 7 = ?$ $9 \times 8 = ?$ $7 \times 7 = ?$

15. $7 \times 8 = ?$ $12 \times 2 = ?$ $2 \times 10 = ?$ $3 \times 6 = ?$

16. $10 \times 5 = ?$ $4 \times 11 = ?$ $12 \times 3 = ?$ $8 \times 8 = ?$

17. $6 \times 11 = ?$ $9 \times 2 = ?$ $7 \times 10 = ?$ $12 \times 4 = ?$

18. $8 \times 5 = ?$ $3 \times 2 = ?$ $4 \times 2 = ?$ $5 \times 2 = ?$

19. $4 \times 3 = ?$ $7 \times 2 = ?$ $5 \times 3 = ?$ $5 \times 4 = ?$

20. $6 \times 6 = ?$ $11 \times 2 = ?$ $8 \times 3 = ?$ $5 \times 5 = ?$

21. $11 \times 3 = ?$ $10 \times 6 = ?$ $6 \times 12 = ?$ $10 \times 3 = ?$

22. $9 \times 12 = ?$ $9 \times 4 = ?$ $4 \times 10 = ?$ $11 \times 10 = ?$

23. $3 \times 3 = ?$ $3 \times 7 = ?$ $4 \times 4 = ?$ $8 \times 4 = ?$

24. $9 \times 3 = ?$ $6 \times 2 = ?$ $6 \times 4 = ?$ $5 \times 6 = ?$

25. $10 \times 12 = ?$ $8 \times 12 = ?$ $9 \times 5 = ?$ $9 \times 9 = ?$

26. $11 \times 11 = ?$ $11 \times 12 = ?$ $11 \times 5 = ?$ $5 \times 12 = ?$

27. $9 \times 10 = ?$ $7 \times 12 = ?$ $8 \times 11 = ?$ $11 \times 9 = ?$

28. $10 \times 10 = ?$ $12 \times 12 = ?$ $8 \times 10 = ?$ $7 \times 11 = ?$

LESSON XIX

1. At 2 cents each, how much will 7 cakes of yeast cost?

SOLUTION. — 7 cakes of yeast will cost 7 times 2 cents, which are 14 cents.

2. At 7 cents each, how much will 3 melons cost?

3. At 6 cents each, how much will 5 pads cost?

4. How many splints will it take to make 9 triangles if 1 splint is used for each side?

5. How many splints will it take to make 7 squares?

6. At \$6 a yard, how much will 8 yards of velvet cost?

NOTE. — The sign \$ means dollars. Thus, \$6 is read 6 dollars.

7. How many quarts are there in 7 pecks?

8. At \$8 apiece, how much will 10 coats cost?

9. What is the cost of 6 class pins at \$7 each?

10. What is the cost of 8 cut glass bowls at \$5 each?

11. If a man travels 7 miles an hour, how far will he travel in 8 hours?

SOLUTION. — He will travel 8 times 7 miles, which are 56 miles.

12. On a chessboard there are 8 rows of squares, and 8 squares in each row. How many squares are on the board?

13. An orchard has 11 rows of trees, and 7 trees in each row. How many trees are there in the orchard?

14. How much will 9 yards of cloth cost at \$6 a yard?

15. How many quarts are there in 9 pecks?

16. How much will a peck of berries cost at 12 cents a quart?

17. Two men start from the same place and travel in opposite directions. One travels 2 miles an hour, the

other 4 miles an hour. How far will they be apart at the end of 3 hours?

SOLUTION.—At the end of 1 hour they will be 2 miles plus 4 miles, which equal 6 miles, apart. At the end of 3 hours they will be 3 times 6 miles, which equal 18 miles, apart.

18. If 2 men can do a piece of work in 3 days, how many days will it take 1 man to do it?

SOLUTION.—It will take 1 man 2 times 3 days, which are 6 days.

19. If 3 men can do a piece of work in 4 days, in how many days can 1 man do it?

20. If 4 men can do a piece of work in 6 days, in how many days can 1 man do it?

21. If a quantity of bread serves 8 men 4 days, how many days will it serve 1 man?

22. If a man can earn \$6 in 1 week, how many dollars can he earn in 8 weeks?

23. A person has a piece of work which 7 men can do in 9 days; but it is necessary to have it done in 1 day. How many men must be employed?

24. If \$9 worth of provisions lasts 8 persons 11 days, how many persons will it last 1 day?

25. If 8 girls can finish a dress in 6 hours, how long would it take one girl?

26. A lady bought 6 yards of silk at \$2 a yard, and 4 pairs of curtains at \$11 a pair. How much did they all cost?

SOLUTION.—The silk cost 6 times \$2, which equals \$12; the curtains cost 4 times \$11, which equals \$44. Hence, all cost \$12 plus \$44, which equals \$56.

27. Find the cost of 7 yards of velvet at \$4 a yard, and 5 pairs of gloves at \$3 a pair.

LESSON XX

1. Margaret bought 2 apples at 2 cents each, 2 pears at 3 cents each, and an orange for 5 cents. How much did all cost?

2. Two men start from the same place and travel in the same direction; one, 5 miles an hour; the other, 7 miles an hour. How far will they be apart in 10 hours?

3. If, in the above question, the men travel in opposite directions, how far apart will they be in 12 hours?

4. A lady went shopping. She bought 4 yards of cloth at \$2 a yard; 2 pairs of gloves at \$1 a pair; and a shawl for \$2. She handed the clerk three \$5 bills. How much change did she receive?

5. A boy bought 4 peaches at 5 cents each, 3 pears at 3 cents each, and 2 pints of chestnuts at 5 cents a pint. How much did they cost?

6. What is the sum of 3 times 9, and 7, less the sum of 8 times 3, and 1?

7. If a man earns \$5 a day, and a boy \$2, how much will both earn in 7 days?

8. A drover gave \$10 and 7 sheep, valued at \$4 a head, for a cow and calf. How much did they cost?

9. A merchant sold cloth at \$7 a yard. A tailor bought of this cloth, at one time, 5 yards, and, at another time, 3 yards. What was the amount of his bill?

10. Two brothers, Henry and Rufus, each received for his work 3 dimes a day. How much did both receive for 6 days' work?

11. If 12 horses can be sustained in a pasture 10 months, how many horses will it feed 1 month?

12. What is 3 times the difference between 15 and the sum of 5 and 2?

13. The sum of two numbers is 23; the smaller is 11. What is 5 times the larger?

14. The difference between two numbers is 7. If the larger is 12, how much will 8 times the smaller be?

15. If I buy 10 cents' worth of pears at 1 cent each, and sell them for 3 cents each, how much shall I make?

16. A peddler bought a book for 50 cents and sold it for \$1. How much would he have made had he bought 2 books at 50 cents each, and sold them at \$1 each?

17. Frank has 5 times 2 marbles less than 50, and John has 5 times 2 more than 50. How many has each? How many more has John than Frank?

18. If \$3 gains \$1 in a certain time, how much will \$12 gain in double the time?

19. A man bought 20 yards of cloth at \$1 a yard. Five yards were useless because they were damaged. The rest he sold at \$2 a yard. How much did he gain?

20. If two men travel in the same direction, one 10 miles and the other 7 miles an hour, how far apart will they be in 7 hours?

21. A stage starts from a certain town, and travels at the rate of 8 miles per hour. At the same time, another starts from the same place, and travels in the same direction, 4 miles per hour. How far apart will they be at the end of 12 hours?

22. A grocer bought 10 barrels of apples at \$3 a barrel. After using 3 barrels, he sold the remainder at \$4 a barrel. How much did the 3 barrels which he used cost him in the end?

23. A grocer bought 6 quarts of berries, at 8 cents a quart. He sold 4 quarts, at 10 cents a quart, and 2 quarts, at 12 cents a quart. How much did he make?

24. If an orange costs 5 cents, and an apple 2 cents, how much will 2 oranges and 4 apples cost?

25. If rice is 8 cents, and dates are 10 cents a pound, how much will 7 pounds of rice and 6 pounds of dates cost?

26. If an orange costs 5 times as much as an apple, how much more will 6 oranges cost than 25 apples, an apple being worth 1 cent?

27. I bought, at one time, 5 yards of gingham, at 10 cents a yard; at another, 10 yards, at 5 cents a yard. How much did it all cost?

28. If a man earns \$15 per week, and spends \$11 a week, how much will he save in 3 weeks? How much will he save in 8 weeks?

29. A miller bought 10 bushels of wheat, at 50 cents a bushel, from which he made 2 barrels of flour that were sold at \$4 each. How much more did he get for the flour than he paid for the wheat?

30. Thomas has 8 books, and his brother has five times as many less 6. How many books have both?

31. How much will 9 pounds of figs cost, at 12 cents a pound?

32. A man employed one laborer for 6 weeks, at 7 dollars a week, and another for 5 days, at 2 dollars a day. How much did he pay to both?

33. A farmer exchanged 5 dozen eggs, at 20 cents a dozen, for 6 pounds of sugar, at 5 cents a pound, and the remainder in money. How many cents were due him?

34. Seven times 9 are how many?

35. How many are 2 times 3 times 4?

36. How many are 4 times 3 times 12?

37. A man bought a calf for 11 dollars and paid six times as much for a cow. How much did both cost him?

38. What is the product of 8 multiplied by 8?

LESSON XXI

1. How much is $5 \times 3 + 6 \times 8$?

SOLUTION.—5 times 3 equal 15; 6 times 8 equal 48. $15 + 48$ equal 63. In such examples be careful to perform the multiplication before the addition or subtraction. Do not say 5 times 3 equal 15; 15 plus 6 equal 21; 21 times 8 equal 168.

How much is:

- | | | |
|------------------------------|-------------------------------|----------------------------|
| 2. $2 \times 3 + 4 \times 6$ | $7 \times 9 - 6 \times 4$ | $7 \times 3 \times 2 + 5$ |
| 3. $4 \times 4 + 7 \times 7$ | $8 \times 4 - 4 \times 8$ | $4 \times 3 \times 2 + 9$ |
| 4. $9 \times 3 + 8 \times 6$ | $3 \times 12 - 6 \times 6$ | $2 \times 4 \times 2 - 7$ |
| 5. $7 \times 5 + 3 \times 8$ | $12 \times 12 - 11 \times 11$ | $3 \times 2 \times 6 - 13$ |
| 6. $6 \times 3 + 8 \times 4$ | $11 \times 10 - 9 \times 8$ | $3 \times 3 \times 3 - 25$ |

The parentheses () show that the quantities are considered as one. Thus (4×2) is 8.

- | | | |
|-----------------------------|---------------------------|----------------------------|
| 7. $2 + 3 + (4 \times 2)$ | $48 - 6 - (3 \times 7)$ | $(3 \times 4) + 20 - 8$ |
| 8. $18 + 7 + (9 \times 3)$ | $50 - 8 - (2 \times 11)$ | $(7 \times 5) + 5 - 5$ |
| 9. $15 + 5 + (8 \times 6)$ | $100 - 4 - (5 \times 10)$ | $(9 \times 9) + 9 - 9$ |
| 10. $14 + 4 + (4 \times 5)$ | $90 - 10 - (4 \times 12)$ | $(10 \times 10) + 10 - 6$ |
| 11. $13 + 8 + (6 \times 6)$ | $60 - 12 - (3 \times 8)$ | $(12 \times 12) + 10 - 10$ |

The square of a number is the number multiplied by itself. The square of 4 is 16 because $4 \times 4 = 16$. The cube of a number is the number multiplied by itself twice. The cube of 2 is 8 because $2 \times 2 \times 2 = 8$.

Find the square of:

Find the cube of:

- | | |
|--------------------------|--------------------------|
| 12. 1. 2. 3. 5. 6. 4. | 14. 1. 2. 3. 4. 5. 6. |
| 13. 7. 10. 9. 8. 11. 12. | 15. 7. 8. 9. 10. 11. 12. |

DIVISION

LESSON XXII

1. At 1 cent each, how many rolls can you buy for 4 cents? *Ans.* 4 rolls.

Why? *Ans.* Because 1 is contained in 4, four times.

2. At 2 cents each, how many apples can you buy for 4 cents?

3. If you divide 6 cents between 2 boys, how many will each get? *Ans.* 3.

Why? *Ans.* Because one half of 6 is 3.

4. If you divide a string 8 inches long into 2 parts, how long will each part be?

5. At 3 cents each, how many peaches can you buy for 6 cents?

6. If 9 cents are divided among 3 children, how many will each get?

7. There are 2 pints in a quart. How many pints are there in 10 quarts?

8. Divide 14 badges between 2 girls. How many will each get?

9. If 3 car fares cost 15 cents, how much does one cost?

10. A boy has 16 marbles, and wishes to divide them into piles of 2 each. How many piles must there be?

11. At 3 cents each, how many pencils can you buy for 18 cents?

12. If 18 pencils are divided among 3 boys, how many will each boy get?

13. How many triangles can you make out of 21 splints, using one for each side?

14. A lady spent 22 cents for tape at 2 cents a yard. How many yards did she buy?

15. At 6 cents each, how many oranges can you buy for 24 cents? How many at 8 cents each? How many nickels can you get in exchange for 25 cents?

16. In an orchard of 25 trees one fifth are apple trees. How many apple trees are there?

17. If a man travels 3 miles in an hour, how many hours will it take him to travel 27 miles?

18. A man divided 28 cents among 4 boys. How many did he give each?

19. If 30 children are arranged in 3 equal rows, how many will there be in each row?

20. There are 32 dimes on a table in 4 piles. How many are there in each pile?

21. Thirty-five blocks are piled in 5 equal rows. How many are there in each row?

22. Six men receive \$36 for a piece of work. What is each man's share?

23. Four quarts make 1 gallon. How many gallons are there in 36 quarts?

24. If a man travels 10 miles in 1 hour, in how many hours will he travel 40 miles?

25. Forty-two cents were divided equally among 6 boys. How many cents did each boy receive?

26. If you divide 45 oranges equally among 9 boys, how many oranges will each boy receive?

Division is the process of finding how many times one number is contained in another, and of separating a number into equal parts.

The **divisor** is the number by which to divide. The **dividend** is the number to be divided. The **quotient** is the result. The sign of division (+) is read *divided by*.

LESSON XXIII

DIVISION TABLE

1 ÷ 1 = 1	2 ÷ 2 = 1	3 ÷ 3 = 1	4 ÷ 4 = 1
2 ÷ 1 = 2	4 ÷ 2 = 2	6 ÷ 3 = 2	8 ÷ 4 = 2
3 ÷ 1 = 3	6 ÷ 2 = 3	9 ÷ 3 = 3	12 ÷ 4 = 3
4 ÷ 1 = 4	8 ÷ 2 = 4	12 ÷ 3 = 4	16 ÷ 4 = 4
5 ÷ 1 = 5	10 ÷ 2 = 5	15 ÷ 3 = 5	20 ÷ 4 = 5
6 ÷ 1 = 6	12 ÷ 2 = 6	18 ÷ 3 = 6	24 ÷ 4 = 6
7 ÷ 1 = 7	14 ÷ 2 = 7	21 ÷ 3 = 7	28 ÷ 4 = 7
8 ÷ 1 = 8	16 ÷ 2 = 8	24 ÷ 3 = 8	32 ÷ 4 = 8
9 ÷ 1 = 9	18 ÷ 2 = 9	27 ÷ 3 = 9	36 ÷ 4 = 9
10 ÷ 1 = 10	20 ÷ 2 = 10	30 ÷ 3 = 10	40 ÷ 4 = 10
11 ÷ 1 = 11	22 ÷ 2 = 11	33 ÷ 3 = 11	44 ÷ 4 = 11
12 ÷ 1 = 12	24 ÷ 2 = 12	36 ÷ 3 = 12	48 ÷ 4 = 12
5 ÷ 5 = 1	6 ÷ 6 = 1	7 ÷ 7 = 1	8 ÷ 8 = 1
10 ÷ 5 = 2	12 ÷ 6 = 2	14 ÷ 7 = 2	16 ÷ 8 = 2
15 ÷ 5 = 3	18 ÷ 6 = 3	21 ÷ 7 = 3	24 ÷ 8 = 3
20 ÷ 5 = 4	24 ÷ 6 = 4	28 ÷ 7 = 4	32 ÷ 8 = 4
25 ÷ 5 = 5	30 ÷ 6 = 5	35 ÷ 7 = 5	40 ÷ 8 = 5
30 ÷ 5 = 6	36 ÷ 6 = 6	42 ÷ 7 = 6	48 ÷ 8 = 6
35 ÷ 5 = 7	42 ÷ 6 = 7	49 ÷ 7 = 7	56 ÷ 8 = 7
40 ÷ 5 = 8	48 ÷ 6 = 8	56 ÷ 7 = 8	64 ÷ 8 = 8
45 ÷ 5 = 9	54 ÷ 6 = 9	63 ÷ 7 = 9	72 ÷ 8 = 9
50 ÷ 5 = 10	60 ÷ 6 = 10	70 ÷ 7 = 10	80 ÷ 8 = 10
55 ÷ 5 = 11	66 ÷ 6 = 11	77 ÷ 7 = 11	88 ÷ 8 = 11
60 ÷ 5 = 12	72 ÷ 6 = 12	84 ÷ 7 = 12	96 ÷ 8 = 12
9 ÷ 9 = 1	10 ÷ 10 = 1	11 ÷ 11 = 1	12 ÷ 12 = 1
18 ÷ 9 = 2	20 ÷ 10 = 2	22 ÷ 11 = 2	24 ÷ 12 = 2
27 ÷ 9 = 3	30 ÷ 10 = 3	33 ÷ 11 = 3	36 ÷ 12 = 3
36 ÷ 9 = 4	40 ÷ 10 = 4	44 ÷ 11 = 4	48 ÷ 12 = 4
45 ÷ 9 = 5	50 ÷ 10 = 5	55 ÷ 11 = 5	60 ÷ 12 = 5
54 ÷ 9 = 6	60 ÷ 10 = 6	66 ÷ 11 = 6	72 ÷ 12 = 6
63 ÷ 9 = 7	70 ÷ 10 = 7	77 ÷ 11 = 7	84 ÷ 12 = 7
72 ÷ 9 = 8	80 ÷ 10 = 8	88 ÷ 11 = 8	96 ÷ 12 = 8
81 ÷ 9 = 9	90 ÷ 10 = 9	99 ÷ 11 = 9	108 ÷ 12 = 9
90 ÷ 9 = 10	100 ÷ 10 = 10	110 ÷ 11 = 10	120 ÷ 12 = 10
99 ÷ 9 = 11	110 ÷ 10 = 11	121 ÷ 11 = 11	132 ÷ 12 = 11
108 ÷ 9 = 12	120 ÷ 10 = 12	132 ÷ 11 = 12	144 ÷ 12 = 12

Exercises on the Table

Divide:

1. By 2: 4 10 6 12 8 14 18 16 20 22 24
2. By 4: 44 16 8 20 12 28 24 32 36 40 48
3. By 3: 36 12 15 21 18 9 6 24 27 30 33
4. By 5: 20 15 10 60 30 25 35 40 45 50 55
5. By 6: 36 12 42 48 24 18 54 30 60 66 72
6. By 9: 81 72 90 108 99 27 18 36 63 45 54
7. By 8: 48 56 64 16 72 24 32 40 80 88 96
8. By 7: 84 14 77 21 70 28 63 35 56 42 49
9. By 10: 30 90 120 110 20 100 40 80 50 70 60
10. By 11: 33 22 110 132 44 121 99 66 55 88 77
11. By 12: 24 72 144 120 96 108 36 48 84 60 132

LESSON XXIV

1. Two is contained in 12 how many times?

SOLUTION. — 2 is contained in 12 six times.

2. Two is contained in 16 how many times? 2 in 24?
3 in 9? 3 in 15? 3 in 21? 3 in 27? 4 in 8? 4 in 20?
4 in 28? 4 in 36? 4 in 48?

3. Five is contained in 15 how many times? 5 in 30?
5 in 45? 5 in 60? 6 in 18? 6 in 24? 6 in 36? 6 in
42? 6 in 54? 6 in 66?

4. Seven is contained in 14 how many times? 7 in 28?
7 in 42? 7 in 56? 7 in 63? 7 in 84? 8 in 24? 8 in
40? 8 in 56? 8 in 72? 8 in 96?

5. Nine is contained in 18 how many times? 9 in 27?
9 in 45? 9 in 54? 9 in 63? 9 in 81? 9 in 108? 10
in 20? 10 in 60? 10 in 90? 10 in 100?

6. Eleven is contained in 55 how many times? 11 in
77? 11 in 99? 11 in 110? 11 in 121? 12 in 24? 12
in 48? 12 in 60? 12 in 72? 12 in 96? 12 in 108?
12 in 120? 12 in 144?

7. If 12 peaches are divided equally among 3 children, how many will each child have?

SOLUTION.— Each child will have one third of 12 peaches, which is 4 peaches.

8. Four boys gave their sister 24 apples, each an equal number. How many did each give?

9. A mother divided 20 cents equally between her 2 little girls. How many did each receive?

10. Five books cost 35 cents. How much is that apiece?

11. A man has \$40. If he spends \$5 a week, how long will it last?

SOLUTION.— The money will last as many weeks as \$5 are contained times in \$40, which are 8 times. Therefore the money will last 8 weeks.

12. If 5 apples are worth 1 pear, how many pears are 25 apples worth? 35 apples? 45 apples?

13. If 6 pears are worth an orange, how many oranges can you get for 30 pears? For 42 pears? For 54 pears? For 66 pears?

14. If 1 man does a piece of work in 42 days, how many days will it take 7 men to perform it?

15. If 1 man can eat a certain quantity of provisions in 56 days, how many days will it last 7 men?

16. If 1 pipe empties a cistern in 63 hours, in how many hours will 9 pipes of the same size empty it?

17. If coats are worth \$9 each, how many coats can be bought for \$27? For \$45? For \$54? For \$63?

18. Ten men bought a horse for \$60. How much did each one pay?

19. If 11 ounces of powder cost 88 cents, how much will 1 ounce cost?

20. A man paid \$108 for 12 sheep. How much was that apiece?

21. In an orchard there are 120 trees in 10 rows. How many trees are there in each row?

22. A man earns \$144 in 12 weeks. How much is that a week? How much a day, allowing 6 working days to the week?

23. If 6 men earn \$84 in 1 week, how much does each man earn in 1 day?

SOLUTION.—In one day all earn one seventh of \$84, which is \$12; hence, each man earns in one day one sixth of \$12, which is \$2.

24. If 9 men earn \$108 in 3 days, how much does 1 man earn? How much does each man earn in 1 day?

25. One man travels at the rate of 15 miles in 3 days; another travels at the rate of 20 miles in 2 days. How much farther in one day does the latter travel than the former?



LESSON XXV

Twelve is how many times 4?

SOLUTION.—As many as 4 is contained times in 12, which is 3.

1. $4 =$ how many times 2 ? 4 ?
2. $6 =$ how many times 2 ? 3 ?
3. $8 =$ how many times 2 ? 4 ?
4. $9 =$ how many times 3 ?
5. $10 =$ how many times 2 ? 5 ?
6. $12 =$ how many times 2 ? 3 ? 4 ? 6 ?
7. $14 =$ how many times 2 ? 7 ?
8. $15 =$ how many times 3 ? 5 ?
9. $16 =$ how many times 2 ? 4 ? 8 ?
10. $18 =$ how many times 2 ? 3 ? 6 ? 9 ?
11. $20 =$ how many times 2 ? 4 ? 5 ? 10 ?
12. $21 =$ how many times 3 ? 7 ?
13. $22 =$ how many times 2 ? 11 ?

14. $24 =$ how many times $2? 3? 4? 6? 8? 12?$
15. $25 =$ how many times $5?$
16. $27 =$ how many times $3? 9?$
17. $28 =$ how many times $4? 7?$
18. $30 =$ how many times $3? 5? 6? 10?$
19. $32 =$ how many times $4? 8?$
20. $33 =$ how many times $3? 11?$
21. $35 =$ how many times $5? 7?$
22. $36 =$ how many times $3? 4? 6? 9? 12?$
23. $40 =$ how many times $4? 5? 8? 10?$
24. $42 =$ how many times $6? 7?$
25. $44 =$ how many times $4? 11?$
26. $45 =$ how many times $5? 9?$
27. $48 =$ how many times $4? 6? 8? 12?$
28. $49 =$ how many times $7?$
29. $50 =$ how many times $5? 10?$
30. $54 =$ how many times $6? 9?$
31. $55 =$ how many times $5? 11?$
32. $56 =$ how many times $7? 8?$
33. $60 =$ how many times $5? 6? 10? 12?$
34. $64 =$ how many times $8?$
35. $66 =$ how many times $6? 11?$
36. $70 =$ how many times $7? 10?$
37. $72 =$ how many times $8? 9?$
38. $77 =$ how many times $7? 11?$
39. $80 =$ how many times $8? 10?$
40. $81 =$ how many times $9?$
41. $84 =$ how many times $7? 12?$
42. $88 =$ how many times $8? 11?$
43. $90 =$ how many times $9? 10?$
44. $96 =$ how many times $8? 12?$
45. $99 =$ how many times $9? 11?$
46. $100 =$ how many times $10?$

$$47. 8 \times ? = 48 \quad 9 + ? = 3 \quad ? \times 12 = 96 \quad 24 + ? = 6$$

$$48. ? \times 6 = 48 \quad 12 + ? = 4 \quad 12 \times ? = 96 \quad 64 + ? = 8$$

$$49. ? \times 9 = 54 \quad 54 + ? = 9 \quad ? \times 7 = 56 \quad 96 + ? = 12$$

LESSON XXVI

1. How many oranges, at 5 cents each, can be exchanged for 10 pears, at 2 cents each?

SOLUTION. — The pears cost 10 times 2 cents, which are 20 cents; for this, as many oranges can be had as 5 cents are contained times in 20 cents, which are 4.

2. A wheel is 10 feet in circumference. How many revolutions will it make in going 120 feet?

3. An orchard contains 10 rows of trees, with 6 trees in a row; if there were but 5 rows, how many trees would there be in a row?

4. I have three times as many marbles as the sum of 1, 2, and 3, is contained times in 60. How many have I?

SOLUTION. — 1 and 2 and 3 are 6; 6 is contained in 60 ten times; 3 times 10 are 30.

5. A man bought 6 boxes of buttons at \$5 a box, and 5 pieces of calico at \$4 a piece. He gave in exchange flour at \$5 a barrel. How many barrels did it take?

SOLUTION. — The buttons cost 6 times \$5, which are \$30; the calico 5 times \$4, which are \$20; both cost \$30 plus \$20, which are \$50. It took as many barrels as \$5 are contained times in \$50, which are 10.

6. If a train goes 6 miles in 5 minutes, how long will it take it to go 24 miles?

SOLUTION. — 24 miles are 4 times 6 miles; hence, it will take 4 times 5 minutes, which are 20 minutes.

7. Two times 6 are contained how many times in the sum of 36 and 12?

8. If 60 is divided by some number, the result will be 10. What is that number?
9. I have a number in my mind which, when divided by 3, equals 2 times 6. What is the number?
10. If I purchase lemons at the rate of 2 for 6 cents, and sell them 7 for 28 cents, how much do I gain on each?
11. A man has a piece of work which 9 men can perform in 2 days. He desires to complete it in 3 days. How many men must he employ?
12. Five times the sum of two numbers is equal to 60; if 7 is one of them, what is the other?
13. Henry has 6 dimes; Thomas, twice as many less 2; and Samuel, 3 times as many as Henry. How many have they together?
14. If to the number of times 4 is contained in 12, you add 3, and subtract the result from 9, how much will remain?
15. Five oranges were sold for 25 cents, and 10 cents were gained. How much did each cost?
16. What number subtracted from 17 will leave double the remainder that 5 from 9 leaves?
17. A boy said that 10 taken from the number of cents he had, left twice as great a remainder as the difference between 12 and 8. How many had he?
18. If you multiply any number, 10, by any other number, 5, and divide the product by the same number, 5, what will be the result?
19. If 2 oranges are worth 5 apples, how many apples are 12 oranges worth?
- SOLUTION.—12 oranges are 6 times 2 oranges; hence, they are worth 6 times 5 apples, which are 30 apples.
20. One man goes 10 miles while another goes 7. When the first has gone 90 miles, how far has the second gone?

21. James earns 8 cents while John earns 12 cents. When John has earned 60 cents, how many has James earned?

22. George recites 5 lessons while Charles recites 4. How many lessons have both recited when Charles has recited 20?

23. A man earns \$9 while a boy earns \$5. How many dollars have both earned when the man has earned \$36?

24. A certain number multiplied by 10 is 5 less than 45. What is that number?

25. William counts 11 while James counts 7. How many does James count while William is counting 77?

26. If 8 sheep cost \$56, how much will 3 sheep cost?

27. If a man travels at the rate of 10 miles an hour, how long will it take him to go 100 miles?

28. How many men can in 5 days do a piece of work that occupies 3 men 10 days?

29. How many men can in 3 days do the same amount of work that employs 9 men 4 days?

The **average** of several quantities is their sum divided by the number of quantities added.

30. What is the average of 4, 6, and 11?

SOLUTION. — $4 + 6 + 11 = 21$; $21 \div 3 = 7$.

31. Find the average of 3, 4, 5.

32. Find the average of 6, 8, 9, 1.

33. Find the average of 2, 3, 5, 4, 1.

34. Find the average of 3, 5, 6, 7, 12.

35. A man bought 5 sheep at \$5 each, and 5 at \$3 each. What was the average price of the sheep?

SOLUTION. — $5 \times \$5 = \25 ; $5 \times \$3 = \15 ; $\$25 + \$15 = \$40$; the number of sheep was $5 + 5 = 10$; $\$40 \div 10 = \4 .

36. Mix 6 pounds of sugar at 3 cents a pound, with 4 pounds at 8 cents a pound. What is the value of 1 pound of the mixture?

37. If a child spends 20 minutes on Monday on his arithmetic, 30 minutes Tuesday, 25 minutes Wednesday, 45 minutes Thursday, and 20 minutes Friday, what is the average time spent per day?

LESSON XXVII

1. How many times 2 are 4×3 ? 6×5 ?
2. How many times 4 are 3×8 ? 2×6 ?
3. How many times 6 are 9×4 ? 3×8 ?
4. How many times 8 are 4×12 ? 6×4 ?
5. How many times 10 are 8×5 ? 5×4 ?
6. How many times 3 are 6×5 ? 9×4 ?
7. How many times 9 are 3×12 ? 12×6 ?
8. How many times 5 are 10×10 ? 10×12 ?
9. How many times 12 are 4×6 ? 6×8 ?
10. What is the value of $4 + 6 + 2$? Of $4 + (6 + 2)$?

SOLUTION.—Both expressions mean the same thing. The division must be performed before the addition. $6 \div 2 = 3$; $4 + 3 = 7$.

11. What is the value of $72 \div 6 - 64 \div 8 + 5 \times 5$?

Of $(72 \div 6) - (64 \div 8) + (5 \times 5)$?

SOLUTION.—Both expressions mean the same thing.

Perform divisions and multiplications before additions and subtractions. $72 \div 6 = 12$; $64 \div 8 = 8$; $5 \times 5 = 25$; $12 - 8 = 4$; $4 + 25 = 29$

Find the value of:

12. $(4 \times 2) + (8 \div 4)$.
13. $(9 + 3) + (8 \div 2) \times 5$.
14. $(88 \div 11) - (64 \div 8) + 9$.
15. $(49 \div 7) + (54 \div 9) - 8$.
16. $(3 \times 12) \div (6 \times 2)$.
17. $(4 \times 10) \div (2 \times 5)$.
18. $(3 \times 8) \div (6 \times 4)$.
19. $(88 \div 11) + (56 \div 7)$.
20. $(12 \times 4) - (10 \div 5)$.
21. $(5 \times 6) \div 6 + (3 \times 4) \div 4$.
22. $(44 \div 4) - (12 \div 2) - (6 \div 3)$.
23. $15 + (6 \div 3) + (72 \div 6) - 10$.
24. $(12 \times 8) - (6 \times 3) + (54 \div 9)$.

FRACTIONS

LESSON XXVIII

A unit is a single thing ; as one apple.

If a unit is divided into 2 equal parts, one of the parts is called *one half*.

1. How many halves are there in 2 apples? In 3? In 4? In 5? In 6? In 7? In 8? In 9? In 10?

SOLUTION. — In 1 apple there are 2 halves, and in 2 apples there are 2 times 2 halves, which are 4 halves.

If a unit is divided into 3 equal parts, each part is called *one third*; 2 parts are called *two thirds*; and 3 parts, *three thirds*, or the whole.

2. How many thirds are there in 2 apples? In 3? In 4? In 5? In 6? In 7? In 8? In 9? In 10?

If a unit is divided into 4 equal parts, each part is called *one fourth*; 2 parts are called *two fourths*; 3 parts, *three fourths*; and 4 parts, *four fourths*, or the whole.

3. How many fourths are there in 2 apples? In 3? In 4? In 5? In 6? In 7? In 8? In 9? In 10?

If a unit is divided into 5 equal parts, each part is called *one fifth*; 2 parts are called *two fifths*; 3 parts, *three fifths*; 4 parts, *four fifths*; and 5 parts, *five fifths*, or the whole.

4. How many fifths are there in 2 apples? In 3? In 4? In 5? In 6? In 7? In 8? In 9? In 10?

If a unit is divided into 6 equal parts, each part is called *one sixth*; 2 parts are called *two sixths*; 3 parts, *three sixths*; 4 parts, *four sixths*; 5 parts, *five sixths*; and 6 parts, *six sixths*, or the whole.

5. How many sixths are there in 2 apples? In 3? In 4? In 5? In 6? In 7? In 8? In 9? In 10?

If a unit is divided into 7 equal parts, each part is called *one seventh*; 2 parts are called *two sevenths*; 3 parts, *three sevenths*; 4 parts, *four sevenths*; 5 parts, *five sevenths*; 6 parts, *six sevenths*; and 7 parts, *seven sevenths*, or the whole.

6. How many sevenths are there in 2 apples? In 3? In 4? In 5? In 6? In 7? In 8? In 9? In 10?

If a unit is divided into 8 equal parts, each part is called *one eighth*; 2 parts are called *two eighths*; 3 parts, *three eighths*; 4 parts, *four eighths*; 5 parts, *five eighths*; 6 parts, *six eighths*; 7 parts, *seven eighths*; and 8 parts, *eight eighths*, or the whole.

7. How many eighths are there in 2 apples? In 3? In 4? In 5? In 6? In 7? In 8? In 9? In 10?

If a unit is divided into 9 equal parts, each part is called *one ninth*; 2 parts are called *two ninths*; 3 parts, *three ninths*; 4 parts, *four ninths*; 5 parts, *five ninths*; 6 parts, *six ninths*; 7 parts, *seven ninths*; 8 parts, *eight ninths*; and 9 parts, *nine ninths*, or the whole.

8. How many ninths are there in 2 apples? In 3? In 4? In 5? In 6? In 7? In 8? In 9? In 10?

9. How many thirds are there in 3 units? How many fifths? Sevenths? Ninths?

10. How many fourths are there in 5 oranges? How many eighths? Thirds?

11. In 11 apples, how many sixths are there? How many halves? Fifths? Ninths?

LESSON XXIX

A **fraction** is one or more equal parts of a unit.

A fraction is represented by writing two numbers, one above the other, with a line between them. Thus, one half is written $\frac{1}{2}$; two fifths are written $\frac{2}{5}$; five sevenths, $\frac{5}{7}$, etc.

The lower number shows the number of parts into which the unit is divided; it is called the **denominator**.

The upper number shows how many parts of the unit are taken; it is called the **numerator**.

The numerator and denominator are styled the **terms** of the fraction.

Write the following fractions:

Two thirds, three fourths, four fifths, five sixths, six sevenths, seven eighths, eight ninths, one tenth, three tenths, nine tenths, seven elevenths, five twelfths, seven thirteenths, nine fourteenths, thirteen fifteenths, one sixteenth, two seventeenths, five eighteenths, six nineteenths, seventeen twentieths, twenty-seven thirty-firsts.

Read the following fractions:

$\frac{2}{5}$, $\frac{4}{7}$, $\frac{5}{9}$, $\frac{7}{12}$, $\frac{8}{17}$, $\frac{17}{22}$, $\frac{24}{31}$, $\frac{35}{42}$, $\frac{49}{61}$.

In the fraction $\frac{2}{5}$, the number of parts, *two*, which are taken, is *less* than the number of parts, *three*, into which the unit is divided; hence, the *value* of the fraction is *less than 1*. In the fraction $\frac{3}{3}$, the number of parts taken *equals* the number of parts into which the unit is divided; hence the *value* of the fraction is *equal to 1*. In the fraction $\frac{4}{3}$, the number of parts taken is *greater* than the number of parts into which a single unit is divided, hence the *value* of the fraction is *greater than 1*.

A **proper fraction** is one whose value is less than 1.

An **improper fraction** is one whose value is equal to or greater than 1.

Point out the proper and the improper fractions in the following examples:

$$\frac{1}{2}, \frac{2}{1}, \frac{3}{4}, \frac{4}{3}, \frac{5}{6}, \frac{6}{5}, \frac{7}{8}, \frac{8}{7}, \frac{9}{10}, \frac{10}{9},$$

$$\frac{11}{12}, \frac{14}{13}, \frac{15}{16}, \frac{17}{18}, \frac{25}{21}, \frac{34}{42}, \frac{54}{45}, \frac{65}{78}.$$

A **mixed number** is composed of a whole number and a fraction. Thus, $2\frac{1}{2}$, $3\frac{1}{3}$, $5\frac{2}{7}$; read, *two and one half*, *three and one third*, *five and two sevenths*.

Read the following examples:

$$4\frac{1}{2}, 6\frac{1}{4}, 7\frac{3}{8}, 9\frac{5}{12}, 18\frac{3}{5}, 22\frac{8}{9}, 35\frac{7}{11}, 48\frac{2}{10}, 69\frac{5}{20}, 75\frac{16}{18}.$$

LESSON XXX

1. If a yard of tape is worth 2 cents, how much is $\frac{1}{2}$ of a yard worth?

SOLUTION. — $\frac{1}{2}$ of a yard is worth $\frac{1}{2}$ of 2 cents, which is 1 cent.

2. If a string is 3 inches long, how long is $\frac{1}{3}$ of the string?

3. A lady had \$6 and spent $\frac{2}{3}$ of it. How much did she spend?

SOLUTION. — $\frac{1}{3}$ of \$6 is \$2; then, $\frac{2}{3}$ of \$6 are 2 times \$2, which are \$4.

4. Fred had 4 apples and gave his brother $\frac{1}{2}$ of them. How many did he give him?

5. How many quarts are there in $\frac{3}{4}$ of a peck?

6. How many cents are $\frac{2}{5}$ of a dime? $\frac{3}{5}$? $\frac{4}{5}$?

7. How many buttons are there in $\frac{5}{6}$ of a dozen?

8. What are $\frac{2}{3}$ of 9?

SOLUTION. — $\frac{1}{3}$ of 9 is 3; $\frac{2}{3}$ of 9 are 2 times 3, which are 6.

9. What are $\frac{3}{4}$ of 20?

10. What are $\frac{2}{5}$ of 15? $\frac{3}{5}$ of 20? $\frac{4}{5}$ of 25?

11. What are $\frac{2}{3}$ of 14? $\frac{3}{4}$ of 21? $\frac{4}{5}$ of 28? $\frac{5}{6}$ of 35?

$\frac{1}{2}$ of 42?

12. What are $\frac{3}{8}$ of 16? $\frac{5}{8}$ of 24? $\frac{7}{8}$ of 32?

13. What are $\frac{2}{9}$ of 9? $\frac{4}{9}$ of 18? $\frac{5}{9}$ of 27? $\frac{7}{9}$ of 36?
 $\frac{8}{9}$ of 45?

14. What are $\frac{3}{10}$ of 10? $\frac{7}{10}$ of 20? $\frac{9}{10}$ of 30?

15. What are $\frac{2}{11}$ of 11? $\frac{3}{11}$ of 22? $\frac{4}{11}$ of 33? $\frac{5}{11}$ of 44?
 $\frac{6}{11}$ of 55? $\frac{7}{11}$ of 66? $\frac{8}{11}$ of 77?

16. What are $\frac{5}{12}$ of 24? $\frac{7}{12}$ of 36? $\frac{11}{12}$ of 48?

17. If 2 apples cost 4 cents, how much will 1 apple cost?

SOLUTION. — 1 apple will cost $\frac{1}{2}$ of 4 cents, which is 2 cents.

18. If 3 yards of cloth cost \$9, how much will 1 yard cost?

19. If 3 oranges are worth 15 cents, how much are 2 oranges worth?

SOLUTION. — 1 orange is worth $\frac{1}{3}$ of 15 cents, or 5 cents; hence, 2 oranges are worth 2 times 5 cents, which are 10 cents.

20. If 4 barrels of flour are sold for \$20, how much would 3 barrels sell for?

21. A grocer sells 5 pounds of cheese for 60 cents. For how much will he sell 7 pounds?

22. A lady bought 8 yards of calico for 72 cents. She afterwards found that she needed 5 yards more. How much did it cost?

23. A drover bought 12 calves for \$120; he sold 7 of them for what they cost him. How much did he get for them?

LESSON XXXI.

1. If a yard of cloth costs 2 dollars, what part of a yard costs 1 dollar?

SOLUTION. — 1 dollar is the cost of $\frac{1}{2}$ a yard.

2. What part of a line 3 inches long is a line 1 inch long?

3. If the price of a yard of cloth is \$3, what part of a yard will cost \$2?

SOLUTION. — \$1 will be the cost of $\frac{1}{3}$ of a yard; then \$2 will be the cost of 2 times $\frac{1}{3}$ of a yard, which are $\frac{2}{3}$ of a yard.

4. There are 4 quarts in a gallon. What part of a gallon are 3 quarts?

5. I have some ribbon 5 yards long. If I cut off 2 yards, what part of it do I cut off? If I cut off 3 yards? 4 yards?

6. If a barrel of flour costs \$6, what part of a barrel will cost \$5?

7. Alfred had 7 marbles and gave his brother 4 of them. What part did he give away?

8. A lady went shopping with \$10; she spent \$7. What part of her money did she spend?

9. If a string is 8 inches long, what part of the string is 5 inches long?

10. 5 is what part of 7?

SOLUTION. — 1 is $\frac{1}{7}$ of 7; hence, 5 is 5 times $\frac{1}{7} = \frac{5}{7}$ of 7.

11. 3 is what part of 8? Of 10? Of 11? Of 20?

12. 4 is what part of 9? Of 11? Of 15? Of 25?

13. 5 is what part of 8? Of 9? Of 12? Of 16?

14. What part of 15 is 2? 7? 8? 11? 13?

15. What part of 20 is 3? 7? 11? 13? 17?

16. $\frac{2}{3}$ of 30 is what part of 23?

17. $\frac{6}{7}$ of 28 is what part of 35?

18. $\frac{3}{8}$ of 21 is what part of 19?

19. $\frac{1}{2}$ of 4 is what part of $\frac{1}{3}$ of 9?

20. $\frac{3}{4}$ of 12 is what part of $\frac{5}{6}$ of 24?

21. $\frac{2}{5}$ of 10 is what part of $\frac{3}{7}$ of 21?

22. $\frac{3}{8}$ of 16 is what part of $\frac{5}{7}$ of 35?

23. $\frac{4}{9}$ of 18 is what part of $\frac{2}{11}$ of 77?

24. $\frac{9}{10}$ of 30 is what part of $\frac{5}{7}$ of 49?

LESSON XXXII

1. If $\frac{1}{2}$ a yard of cloth costs 1 dollar, how much does 1 yard cost?

SOLUTION. — 1 yard costs 2 times 1 dollar = 2 dollars.

2. If $\frac{1}{3}$ of a line is 2 inches, what is the length of the line?
 3. If $\frac{2}{3}$ of the distance to school is 6 blocks, what is the whole distance?

SOLUTION. — $\frac{1}{3}$ of the distance is $\frac{1}{3}$ of 6 blocks = 3 blocks; hence the distance is 3 times 3 blocks, which are 9 blocks.

4. If $\frac{3}{4}$ of the distance around a square is 9 inches, what is the whole distance?

5. If it takes 10 minutes to work $\frac{2}{5}$ of the examples in a lesson, how long will it take to work them all?

6. If $\frac{4}{5}$ of the number of beads on a chain are 12, what is the whole number?

7. If $\frac{5}{6}$ of the buttons in a box are 35, what is the whole number?

8. 6 is $\frac{2}{7}$ of what number?

SOLUTION. — $\frac{1}{7}$ of the number is $\frac{1}{2}$ of 6 = 3; hence, the number is 7 times 3 = 21.

9. 6 is $\frac{2}{11}$ of what number?

10. 12 is $\frac{3}{4}$ of what number? $\frac{3}{5}$? $\frac{3}{7}$? $\frac{3}{8}$? $\frac{3}{10}$? $\frac{3}{11}$?

11. 20 is $\frac{4}{5}$ of what number? $\frac{4}{7}$? $\frac{4}{9}$? $\frac{4}{11}$?

12. 30 is $\frac{5}{6}$ of what number? $\frac{5}{7}$? $\frac{5}{8}$? $\frac{5}{9}$? $\frac{5}{11}$? $\frac{5}{12}$?

13. 42 is $\frac{6}{7}$ of what number? $\frac{6}{11}$?

14. 56 is $\frac{7}{8}$ of what number? $\frac{7}{9}$? $\frac{7}{10}$?

15. 72 is $\frac{8}{9}$ of what number? $\frac{8}{11}$?

16. 90 is $\frac{9}{10}$ of what number?

17. If you have 8 cents, and $\frac{3}{4}$ of your money equals $\frac{2}{3}$ of mine, how many cents have I?

SOLUTION. — $\frac{3}{4}$ of 8 cents = 6 cents; then, if $\frac{3}{4}$ of my money = 6 cents, $\frac{1}{4}$ of my money is $\frac{1}{3}$ of 6 cents = 2 cents, and all my money is 3 times 2 cents = 6 cents.

18. Dick says to Frank, "Your age is 15 years, and $\frac{1}{4}$ of your age is $\frac{3}{4}$ of mine." What is Dick's age?

19. $\frac{5}{6}$ of 18 are $\frac{2}{3}$ of what number?

SOLUTION. — $\frac{1}{3}$ of 18 = 6; then $\frac{2}{3}$ of some number = 12. $\frac{1}{3}$ of the number is $\frac{1}{3}$ of 12 = 4, and the number is 3 times 4 = 12.

20. $\frac{6}{7}$ of 14 are $\frac{3}{8}$ of what number?

21. $\frac{5}{8}$ of 16 are $\frac{2}{7}$ of what number?

22. $\frac{3}{9}$ of 27 are $\frac{3}{10}$ of what number?

23. $\frac{5}{9}$ of 36 are $\frac{4}{11}$ of what number?

24. $\frac{7}{10}$ of 20 are $\frac{2}{11}$ of what number?

25. $\frac{3}{11}$ of 55 are $\frac{5}{12}$ of what number?

LESSON XXXIII

1. Divide 3 apples between 2 boys, giving to each the same amount.

SOLUTION. — Each boy will receive $\frac{1}{2}$ of 3 apples, which is $\frac{3}{2} = 1\frac{1}{2}$ apples.

2. A grocer gave 4 oranges to 3 boys to be divided equally among them. What was the share of each?

3. If 2 pears cost 5 cents, how much is that apiece?

4. If 3 yards of cloth cost \$5, what is the price per yard?

5. Henry bought 4 pens for 5 cents. What was the cost of each?

6. $\frac{1}{5}$ of 6 = what?

SOLUTION. — $\frac{1}{5}$ of 6 is $\frac{6}{5} = 1\frac{1}{5}$.

7. $\frac{2}{3}$ of 7 = what? $\frac{1}{3}$ of 7? $\frac{1}{4}$ of 7? $\frac{1}{5}$ of 7? $\frac{1}{6}$ of 7?

8. $\frac{1}{8}$ of 8 = what? $\frac{1}{5}$ of 8? $\frac{1}{7}$ of 8?

9. $\frac{1}{2}$ of 9 = what? $\frac{1}{4}$ of 9? $\frac{1}{5}$ of 9? $\frac{1}{7}$ of 9? $\frac{1}{8}$ of 9?

10. $\frac{1}{3}$ of 10 = what? $\frac{1}{7}$ of 10? $\frac{1}{9}$ of 10?

11. $\frac{1}{2}$ of 11 = what? $\frac{1}{3}$ of 11? $\frac{1}{4}$ of 11? $\frac{1}{5}$ of 11? $\frac{1}{6}$ of 11? $\frac{1}{7}$ of 11? $\frac{1}{8}$ of 11? $\frac{1}{9}$ of 11? $\frac{1}{10}$ of 11?

12. $\frac{1}{5}$ of 12 = what? $\frac{1}{7}$ of 12? $\frac{1}{11}$ of 12?

13. For 5 cents, how many apples can I buy at 2 cents each?

SOLUTION. — I can buy as many apples as 2 cents are contained times in 5 cents, which are $\frac{5}{2} = 2\frac{1}{2}$.

14. At \$2 a yard, how many yards of cloth can be purchased for \$7?

15. Harriet spent 13 cents for braid, at 4 cents a yard. How many yards did she buy?

16. When ribbon is worth 4 cents a yard, how many yards can you get for 17 cents?

17. How many 6-inch strips can you cut from a piece of muslin 23 inches long?

18. How many weeks are there in 25 days?

19. How many times 2 is 13?

SOLUTION. — As many as 2 is contained times in 13, which are $\frac{13}{2} = 6\frac{1}{2}$.

20. How many times 2 is 15? 17? 19? 21? 23?

21. How many times 3 is 20? 26? 29? 31? 35?

22. How many times 4 is 27? 33? 39? 41? 47?

23. How many times 6 is 43? 47? 49? 59? 61?

24. How many times 7 is 24? 32? 40? 48? 57?

25. How many times 8 is 45? 55? 67? 71? 81?

26. How many times 9 is 34? 38? 50? 58? 64?

27. How many times 10 is 63? 69? 77? 83? 91?

28. How many times 11 is 42? 46? 54? 60? 70?

29. How many times 12 is 68? 79? 85? 89? 95?

LESSON XXXIV

1. How many halves are there in $2\frac{1}{2}$?

SOLUTION. — In 1 there are $\frac{2}{2}$; hence, in 2 there are 2 times $\frac{2}{2} = \frac{4}{2}$; $\frac{4}{2} + \frac{1}{2} = \frac{5}{2}$.

2. How many halves are there in $3\frac{1}{2}$? $4\frac{1}{2}$? $5\frac{1}{2}$? $6\frac{1}{2}$?

3. How many thirds are there in $4\frac{1}{3}$? $5\frac{2}{3}$? $6\frac{1}{3}$? $7\frac{2}{3}$?

4. How many fourths are there in $3\frac{1}{4}$? $4\frac{3}{4}$? $5\frac{1}{4}$? $6\frac{3}{4}$?
5. How many fifths are there in $1\frac{1}{5}$? $3\frac{2}{5}$? $6\frac{3}{5}$? $7\frac{1}{5}$?
6. How many sixths are there in $2\frac{1}{6}$? $4\frac{5}{6}$? $5\frac{1}{6}$? $6\frac{5}{6}$?
7. How many sevenths are there in $5\frac{3}{7}$? $6\frac{4}{7}$? $7\frac{5}{7}$? $8\frac{6}{7}$?
8. How many eighths are there in $3\frac{3}{8}$? $4\frac{7}{8}$? $5\frac{1}{8}$? $6\frac{3}{8}$?
9. How many ninths are there in $6\frac{8}{9}$? $7\frac{1}{9}$? $8\frac{2}{9}$? $9\frac{5}{9}$?
10. How many tenths are there in $6\frac{3}{10}$? $7\frac{7}{10}$? $8\frac{2}{10}$? $9\frac{1}{10}$?
11. How many elevenths are there in $6\frac{5}{11}$? $7\frac{6}{11}$? $8\frac{7}{11}$? $9\frac{8}{11}$?
12. How many twelfths are there in $5\frac{1}{12}$? $6\frac{7}{12}$? $7\frac{5}{12}$? $9\frac{5}{12}$?

LESSON XXXV

A fraction is in its lowest terms when no number greater than 1 will divide both terms.

1. Reduce $\frac{2}{4}$ to its lowest terms.

SOLUTION. — Dividing both terms of $\frac{2}{4}$ by 2, the result is $\frac{1}{2}$.

2. Reduce $\frac{3}{6}$ to its lowest terms.
3. Reduce $\frac{4}{8}$ to its lowest terms.
4. Reduce $\frac{5}{10}$ to its lowest terms.
5. Reduce $\frac{6}{12}$ to its lowest terms.

SOLUTION. — Dividing both terms of $\frac{3}{6}$ by 3, the result is $\frac{1}{2}$; dividing both terms of $\frac{4}{8}$ by 4, the result is $\frac{1}{2}$.

Reduce to their lowest terms:

6.	$\frac{5}{10}$	$\frac{8}{9}$	$\frac{6}{8}$	$\frac{4}{10}$	$\frac{8}{10}$	$\frac{10}{12}$	$\frac{8}{6}$	$\frac{8}{16}$	$\frac{14}{28}$	$\frac{28}{84}$	$\frac{50}{100}$
7.	$\frac{6}{12}$	$\frac{5}{15}$	$\frac{9}{12}$	$\frac{6}{15}$	$\frac{12}{15}$	$\frac{15}{18}$	$\frac{7}{14}$	$\frac{19}{38}$	$\frac{18}{54}$	$\frac{25}{75}$	$\frac{100}{300}$
8.	$\frac{8}{12}$	$\frac{12}{16}$	$\frac{10}{25}$	$\frac{12}{20}$	$\frac{20}{24}$	$\frac{21}{42}$	$\frac{10}{15}$	$\frac{11}{44}$	$\frac{55}{55}$	$\frac{72}{72}$	$\frac{200}{800}$
9.	$\frac{9}{24}$	$\frac{10}{35}$	$\frac{15}{20}$	$\frac{18}{30}$	$\frac{25}{30}$	$\frac{32}{56}$	$\frac{12}{24}$	$\frac{23}{46}$	$\frac{20}{60}$	$\frac{28}{74}$	$\frac{125}{625}$
10.	$\frac{12}{27}$	$\frac{14}{21}$	$\frac{18}{24}$	$\frac{21}{35}$	$\frac{30}{36}$	$\frac{36}{63}$	$\frac{16}{48}$	$\frac{8}{48}$	$\frac{31}{62}$	$\frac{25}{75}$	$\frac{200}{1200}$
11.	$\frac{12}{30}$	$\frac{16}{24}$	$\frac{21}{28}$	$\frac{24}{40}$	$\frac{30}{42}$	$\frac{35}{56}$	$\frac{4}{22}$	$\frac{14}{52}$	$\frac{11}{66}$	$\frac{18}{78}$	$\frac{300}{2100}$
12.	$\frac{18}{27}$	$\frac{20}{25}$	$\frac{24}{32}$	$\frac{25}{40}$	$\frac{25}{45}$	$\frac{35}{45}$	$\frac{13}{26}$	$\frac{25}{50}$	$\frac{13}{39}$	$\frac{11}{77}$	$\frac{300}{2400}$
13.	$\frac{27}{36}$	$\frac{36}{45}$	$\frac{45}{54}$	$\frac{48}{56}$	$\frac{49}{56}$	$\frac{56}{63}$	$\frac{11}{33}$	$\frac{23}{52}$	$\frac{23}{69}$	$\frac{39}{78}$	$\frac{2700}{2700}$
14.	$\frac{28}{35}$	$\frac{40}{48}$	$\frac{42}{49}$	$\frac{42}{54}$	$\frac{63}{72}$	$\frac{72}{81}$	$\frac{17}{34}$	$\frac{20}{60}$	$\frac{64}{96}$	$\frac{25}{80}$	$\frac{100}{1000}$

LESSON XXXVI

1. Reduce $\frac{1}{2}$ to fourths.

SOLUTION. — In 1 there are four fourths; hence, in $\frac{1}{2}$ there is $\frac{1}{2}$ of 4 fourths = 2 fourths.

2. Reduce $\frac{1}{3}$ to sixths. 5. Reduce $\frac{1}{6}$ to twelfths.
 3. Reduce $\frac{1}{4}$ to eighths. 6. Reduce $\frac{1}{8}$ to ninths.
 4. Reduce $\frac{1}{5}$ to tenths. 7. Reduce $\frac{1}{4}$ to twelfths.
 8. Reduce $\frac{2}{3}$ to sixths.

SOLUTION. — $1 = \frac{6}{6}$; hence, $\frac{1}{3} = \frac{2}{6}$, and $\frac{2}{3} = \frac{4}{6}$.

9. Reduce $\frac{2}{3}$ to ninths. Reduce $\frac{3}{4}$ to twelfths.
 10. Reduce $\frac{3}{4}$ to eighths. Reduce $\frac{4}{5}$ to twelfths.
 11. Reduce $\frac{2}{5}$ to tenths. Reduce $\frac{2}{3}$ to fifteenths.
 12. Reduce $\frac{3}{5}$ to twentieths. Reduce $\frac{3}{4}$ to twenty-fifths.
 13. Reduce $\frac{4}{5}$ to thirtieths. Reduce $\frac{4}{5}$ to thirty-fifths.
 14. Reduce $\frac{5}{6}$ to twelfths. Reduce $\frac{5}{6}$ to eighteenth.
 15. Reduce $\frac{7}{8}$ to fourteenths. Reduce $\frac{7}{8}$ to twenty-firsts.
 16. Reduce $\frac{5}{7}$ to twenty-eighths. Reduce $\frac{5}{7}$ to thirty-fifths.
 17. Reduce $\frac{3}{4}$ to sixteenths. Reduce $\frac{3}{4}$ to twenty-fourths.
 18. Reduce $\frac{5}{6}$ to thirty-seconds. Reduce $\frac{5}{6}$ to fortieths.
 19. Reduce $\frac{2}{3}$ to eighteenth. Reduce $\frac{2}{3}$ to twenty-sevenths.
 20. Reduce $\frac{4}{5}$ to thirty-sixths. Reduce $\frac{4}{5}$ to forty-fifths.
 21. Reduce $\frac{5}{6}$ to fifty-fourths. Reduce $\frac{5}{6}$ to sixty-thirds.
 22. Reduce $\frac{7}{10}$ to twentieths. Reduce $\frac{7}{10}$ to thirtieths.
 23. Reduce $\frac{5}{12}$ to twenty-fourths. Reduce $\frac{5}{12}$ to thirty-sixths.

LESSON XXXVII

When two or more fractions have the same denominators, they are said to have a **common denominator**. The common denominator may be found by multiplying the denominators together, or by finding their least common multiple, that is, the least number that can be divided by them.

1. Reduce $\frac{2}{3}$ and $\frac{3}{4}$ to equivalent fractions having a common denominator.

SOLUTION. — The common denominator is $3 \times 4 = 12$. $\frac{2}{3} = \frac{8}{12}$, $\frac{3}{4} = \frac{9}{12}$.

Reduce to equivalent fractions having a common denominator :

2. $\frac{1}{2}$ and $\frac{1}{3}$. $\frac{1}{2}$ and $\frac{1}{5}$. $\frac{1}{3}$ and $\frac{1}{5}$.
3. $\frac{1}{3}$ and $\frac{1}{4}$. $\frac{1}{3}$ and $\frac{1}{6}$. $\frac{1}{4}$ and $\frac{1}{5}$.
4. $\frac{2}{3}$ and $\frac{2}{5}$. $\frac{2}{3}$ and $\frac{2}{6}$. $\frac{2}{3}$ and $\frac{2}{5}$.
5. $\frac{3}{4}$ and $\frac{2}{5}$. $\frac{3}{4}$ and $\frac{3}{5}$. $\frac{3}{4}$ and $\frac{3}{5}$.
6. $\frac{2}{5}$ and $\frac{5}{6}$. $\frac{2}{5}$ and $\frac{5}{6}$. $\frac{4}{5}$ and $\frac{5}{6}$.
7. $\frac{5}{6}$ and $\frac{2}{7}$. $\frac{5}{6}$ and $\frac{3}{7}$. $\frac{5}{6}$ and $\frac{4}{7}$.
8. $\frac{5}{7}$ and $\frac{3}{8}$. $\frac{6}{7}$ and $\frac{5}{8}$. $\frac{7}{8}$ and $\frac{2}{3}$.
9. $\frac{4}{9}$ and $\frac{3}{10}$. $\frac{5}{9}$ and $\frac{7}{10}$. $\frac{7}{9}$ and $\frac{9}{10}$.
10. $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{5}$. $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$.
11. $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{2}{5}$. $\frac{3}{5}$, $\frac{5}{6}$, and $\frac{1}{2}$.

12. Reduce $\frac{3}{4}$ and $\frac{5}{6}$ to equivalent fractions having the least common denominator.

SOLUTION. — The least common denominator is 12. $\frac{3}{4} = \frac{9}{12}$; $\frac{5}{6} = \frac{10}{12}$.

Reduce to equivalent fractions having the least common denominator :

13. $\frac{1}{2}$ and $\frac{1}{4}$. $\frac{1}{2}$ and $\frac{1}{6}$. $\frac{1}{3}$ and $\frac{1}{6}$.
14. $\frac{2}{3}$ and $\frac{5}{6}$. $\frac{3}{4}$ and $\frac{3}{8}$. $\frac{2}{3}$ and $\frac{2}{5}$.
15. $\frac{5}{6}$ and $\frac{5}{8}$. $\frac{5}{6}$ and $\frac{7}{9}$. $\frac{7}{8}$ and $\frac{5}{12}$.
16. $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$. $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{6}$.

17. $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{5}{6}$. $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{5}{6}$.
 18. $\frac{2}{3}$, $\frac{5}{6}$, and $\frac{7}{8}$. $\frac{2}{3}$, $\frac{5}{6}$, and $\frac{7}{8}$.
 19. $\frac{3}{4}$, $\frac{4}{9}$, and $\frac{5}{12}$. $\frac{5}{6}$, $\frac{8}{9}$, and $\frac{7}{12}$.
 20. $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{6}$. $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{6}$, and $\frac{1}{10}$.
 21. $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$, and $\frac{7}{8}$. $\frac{1}{3}$, $\frac{1}{4}$, $\frac{5}{6}$, and $\frac{7}{12}$.
 22. $\frac{3}{4}$, $\frac{5}{6}$, $\frac{7}{8}$, and $\frac{9}{12}$. $\frac{2}{5}$, $\frac{4}{6}$, $\frac{6}{8}$, and $\frac{5}{12}$.
 23. $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, and $\frac{1}{8}$. $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$, $\frac{7}{8}$, and $\frac{1}{12}$.
 24. $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, $\frac{5}{6}$, $\frac{6}{10}$, and $\frac{1}{12}$.

LESSON XXXVIII

1. Charles divided a melon, giving to his sister $\frac{1}{2}$, and to his brother $\frac{1}{4}$. What part did he give away?

SOLUTION. — He gave away $\frac{1}{2} + \frac{1}{4}$. $\frac{1}{2} = \frac{2}{4}$; $\frac{2}{4} + \frac{1}{4} = \frac{3}{4}$ of a melon.

2. Thomas paid $\frac{3}{4}$ of a dollar for a knife, and $\frac{1}{2}$ of a dollar for a ball. How much did he give for both?

3. The distance from A to B is $\frac{1}{2}$ a mile, and from B to C $\frac{2}{3}$ of a mile. What is the distance from A to C?

4. I give Mary $\frac{1}{2}$, Jane $\frac{1}{4}$, and William $\frac{1}{8}$ of an orange. How much do I give to all?

5. What is the sum of $\frac{1}{4}$ and $\frac{1}{8}$?

6. Thomas bought a copy book for \$ $\frac{1}{10}$, and a reader for \$ $\frac{1}{2}$. How much did both cost?

7. If I draw a line $1\frac{1}{4}$ inches long and then extend it $2\frac{1}{2}$ inches, how long will it be?

SOLUTION. — $1\frac{1}{4} = \frac{5}{4}$; $2\frac{1}{2} = \frac{5}{2}$. $\frac{5}{4} + \frac{5}{2} = 3\frac{5}{4}$ inches.

8. I planted $2\frac{1}{2}$ acres of ground in corn, and $8\frac{3}{8}$ acres in oats. How many acres did I plant?

9. If I walk $\frac{1}{2}$ of a mile in the morning, $\frac{1}{8}$ of a mile at noon, and $\frac{5}{8}$ of a mile in the evening, how far do I walk all together?

10. Add $\frac{1}{2}$ and $\frac{3}{8}$. $\frac{1}{2}$ and $\frac{3}{8}$. $\frac{3}{8}$ and $\frac{3}{4}$.

11. Add $\frac{1}{3}$ and $\frac{2}{6}$. $\frac{1}{4}$ and $\frac{1}{6}$. $\frac{1}{4}$ and $\frac{1}{8}$.

12. Add $\frac{1}{2}$ and $\frac{1}{4}$. $\frac{3}{4}$ and $\frac{5}{7}$. $\frac{3}{4}$ and $\frac{5}{8}$.

13. Add $\frac{5}{8}$ and $\frac{4}{5}$. $\frac{5}{9}$ and $\frac{5}{8}$. $\frac{5}{7}$ and $\frac{5}{8}$.

14. Add $\frac{1}{8}$ and $\frac{1}{6}$. $\frac{1}{2}$ and $\frac{1}{8}$. $\frac{3}{4}$ and $\frac{1}{6}$.

Find the value of:

- | | | | | |
|---|-----------------------------|-----------------------------|--|---|
| 15. $\frac{6}{7} + \frac{5}{8}$ | $\frac{1}{7} + \frac{2}{3}$ | $\frac{4}{9} + \frac{5}{6}$ | 20. $\frac{1}{3} + \frac{1}{4} + \frac{5}{8}$ | $\frac{1}{8} + \frac{1}{6} + \frac{3}{4}$ |
| 16. $\frac{2}{3} + \frac{3}{8}$ | $\frac{5}{6} + \frac{7}{9}$ | $\frac{3}{8} + \frac{1}{7}$ | 21. $\frac{1}{2} + \frac{3}{4} + \frac{7}{8}$ | $\frac{1}{11} + \frac{1}{10} + \frac{2}{5}$ |
| 17. $\frac{3}{8} + \frac{7}{9}$ | $\frac{3}{8} + \frac{1}{4}$ | $\frac{3}{7} + \frac{3}{4}$ | 22. $\frac{3}{5} + \frac{1}{2} + \frac{7}{10}$ | $\frac{3}{8} + \frac{3}{4} + \frac{1}{12}$ |
| 18. $\frac{4}{5} + \frac{1}{3}$ | $\frac{2}{9} + \frac{1}{8}$ | $\frac{5}{8} + \frac{2}{9}$ | 23. $\frac{1}{4} + \frac{1}{6} + \frac{5}{12}$ | $\frac{2}{7} + \frac{1}{14} + \frac{2}{21}$ |
| 19. $\frac{2}{6} + \frac{1}{9}$ | $\frac{3}{4} + \frac{2}{9}$ | $\frac{5}{6} + \frac{3}{8}$ | 24. $\frac{1}{3} + \frac{2}{5} + \frac{7}{10}$ | $\frac{5}{6} + \frac{4}{9} + \frac{8}{18}$ |
| 25. Add $3\frac{3}{4}$ and $4\frac{5}{8}$. | | | | |

SOLUTION. — $3 + 4 = 7$; $\frac{3}{4} + \frac{5}{8} = 1\frac{1}{2}$; $7 + 1\frac{1}{2} = 8\frac{1}{2}$.

Find the value of:

- | | | | |
|-----------------------------------|--|-----------------------------------|---|
| 26. $4\frac{3}{7} + 5\frac{1}{8}$ | $1\frac{1}{2} + 2\frac{3}{4} + \frac{1}{5}$ | 29. $6\frac{3}{8} + 3\frac{3}{4}$ | $\frac{7}{8} + 1\frac{3}{8} + 3\frac{3}{4}$ |
| 27. $5\frac{3}{8} + 4\frac{4}{9}$ | $3\frac{1}{3} + 4 + 5\frac{5}{8}$ | 30. $4\frac{1}{4} + 5\frac{1}{8}$ | $3\frac{1}{4} + 5\frac{5}{8} + 6\frac{1}{16}$ |
| 28. $2\frac{4}{9} + 2\frac{1}{6}$ | $5\frac{1}{3} + 3\frac{3}{8} + 8\frac{1}{6}$ | 31. $5\frac{1}{3} + 3\frac{1}{6}$ | $6\frac{1}{2} + 1\frac{3}{8} + 2\frac{3}{4}$ |

LESSON XXXIX

1. Frank received $\frac{1}{2}$ a melon and Charles $\frac{1}{3}$. How much more did Frank receive than Charles?

SOLUTION. — Frank received more than Charles $\frac{1}{2} - \frac{1}{3}$. $\frac{1}{2} = \frac{3}{6}$; $\frac{1}{3} = \frac{2}{6}$. $\frac{3}{6} - \frac{2}{6} = \frac{1}{6}$ of a melon.

2. If I give Mabel $\frac{1}{2}$ of a yard of silk for a doll's dress, and Jean $\frac{1}{4}$ of a yard, how much more will Mabel have than Jean?

3. James bought 2 melons; he gave Lucy half of the first, and Jane two thirds of the second. What part of a melon had Jane more than Lucy?

4. How much longer is a line $1\frac{1}{4}$ inches long than a line $\frac{3}{8}$ of an inch long.

5. Richard bought a quart of chestnuts, and gave $\frac{1}{2}$ to his mother and $\frac{1}{8}$ to his sister. How much more did he give his mother than his sister?

6. How much longer is a stick $2\frac{1}{2}$ feet long than a stick $1\frac{1}{2}$ feet long?

SOLUTION. — $1\frac{1}{2} = \frac{3}{2}$; $2\frac{1}{2} = \frac{5}{2}$; $\frac{5}{2} - \frac{3}{2} = \frac{2}{2}$.

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|---|------------------------------------|------------------------------------|
| 7. Take $\frac{1}{2}$ from $\frac{1}{2}$. | $\frac{1}{2}$ from $\frac{1}{2}$. | $\frac{1}{2}$ from $\frac{1}{2}$. |
| 8. Take $\frac{2}{3}$ from $\frac{1}{3}$. | $\frac{1}{3}$ from $\frac{1}{3}$. | $\frac{1}{3}$ from $\frac{1}{3}$. |
| 9. Take $\frac{1}{4}$ from $\frac{3}{4}$. | $\frac{3}{4}$ from $\frac{3}{4}$. | $\frac{3}{4}$ from $\frac{3}{4}$. |
| 10. Take $\frac{1}{5}$ from $\frac{4}{5}$. | $\frac{1}{5}$ from $\frac{4}{5}$. | $\frac{1}{5}$ from $\frac{4}{5}$. |
| 11. Take $\frac{2}{6}$ from $\frac{5}{6}$. | $\frac{2}{6}$ from $\frac{5}{6}$. | $\frac{2}{6}$ from $\frac{5}{6}$. |
| 12. Take $\frac{1}{8}$ from $\frac{7}{8}$. | $\frac{7}{8}$ from $\frac{7}{8}$. | $\frac{7}{8}$ from $\frac{7}{8}$. |

Find the value of:

- | | | | |
|---|-----------------------------|-----------------------------|---------------------------------|
| 13. $\frac{1}{2} - \frac{1}{2}$ | $\frac{1}{2} - \frac{2}{2}$ | $\frac{1}{2} - \frac{3}{2}$ | 15. $\frac{3}{4} - \frac{1}{4}$ |
| 14. $\frac{1}{3} - \frac{2}{3}$ | $\frac{2}{3} - \frac{1}{3}$ | $\frac{2}{3} - \frac{2}{3}$ | 16. $\frac{3}{4} - \frac{1}{4}$ |
| 17. Take $2\frac{1}{2}$ from $5\frac{1}{2}$. | | | |

SOLUTION. — We can not subtract $\frac{2}{3}$ from $\frac{1}{3}$; but $\frac{1}{3} = \frac{2}{6}$, and can subtract $\frac{2}{6}$ from $\frac{2}{6}$. $1\frac{1}{2} - \frac{1}{2} = 1$, $4 - 2 = 2$.

- | | |
|---|--------------------------------------|
| 18. Take $3\frac{1}{2}$ from $7\frac{1}{2}$. | $4\frac{1}{2}$ from $8\frac{1}{2}$. |
| 19. Take $5\frac{1}{2}$ from $7\frac{1}{2}$. | $6\frac{1}{2}$ from $8\frac{1}{2}$. |

Find the value of:

- | | | |
|-----------------------------------|-------------------------------|-----|
| 20. $4\frac{1}{2} - 1\frac{1}{2}$ | $8\frac{1}{2} - 6\frac{1}{2}$ | 12. |
| 21. $2\frac{1}{2} - 1\frac{1}{2}$ | $6\frac{1}{2} - 2\frac{3}{4}$ | 10. |
| 22. $8\frac{1}{2} - 3\frac{1}{2}$ | $5\frac{1}{2} - 3$ | 11. |
| 23. $5\frac{1}{2} - 3\frac{1}{2}$ | $7\frac{1}{2} - 4\frac{1}{2}$ | 15. |
| 24. $4\frac{1}{2} - 2\frac{1}{2}$ | $4\frac{1}{2} - 2\frac{1}{2}$ | 18. |

LESSON XL

1. Ruth divided a quart of pecans, giving Kate $\frac{1}{2}$ of them. How much had she left?

SOLUTION. — Ruth gave away $\frac{1}{2} \div \frac{1}{2} = \frac{1}{1}$ of a quart. $1 - \frac{1}{1} = \frac{0}{1}$ of a quart.

2. After taking away $\frac{1}{2}$ and $\frac{1}{3}$ of an apple, how much will be left?

3. Thomas wishes to divide an orange, and give Anne $\frac{1}{4}$, and Lucy $\frac{2}{5}$. How much will he have left?

4. A farmer sows $\frac{1}{2}$ of a field in rye, $\frac{1}{6}$ in barley, and the remainder in oats. How much does he sow in oats?

5. A man, having 72 miles to travel, went $\frac{1}{3}$ the distance the first day, $\frac{2}{5}$ the second, and the remainder the third day. What part did he travel the last day, and how far?

6. David bought a pound of figs. He gave $\frac{1}{3}$ to his mother, $\frac{1}{4}$ to his sister, and $\frac{1}{6}$ to his brother. What part had he left?

7. I had $1\frac{1}{2}$ yards of ribbon. I cut off first $\frac{1}{2}$ a yard, and then $\frac{1}{3}$ of a yard. How much was left?

8. A baker had $\frac{7}{8}$ of a pound of raisins. He used half of a pound for one cake, and $\frac{1}{4}$ of a pound for another. How much had he left?

9. I sewed together two strips of muslin, one $3\frac{1}{3}$ yards long, and the other $2\frac{1}{2}$ yards long. Then I cut off $1\frac{1}{2}$ yards. How much was left?

10. It is $\frac{5}{8}$ of a mile from my house to school. When I had gone $\frac{1}{3}$ of a mile I met Tom; $\frac{1}{16}$ of a mile farther on I met Frank; and $\frac{1}{4}$ of a mile farther on I met Albert. What part of a mile to school was it when I met Albert?

11. Ella's mother gave her a book. She read the first day $\frac{1}{5}$; the second, $\frac{1}{4}$; the third, $\frac{1}{2}$; and the fourth, the remainder. What part did she read the fourth day?

12. A farmer has a flock of 84 sheep in four fields. The first contains $\frac{1}{4}$; the second, $\frac{1}{3}$; and the third, $\frac{1}{4}$ of them. How many does the fourth field contain?

13. Daniel spends $\frac{1}{3}$ of his time in sleep, $\frac{1}{4}$ of it at school, $\frac{1}{12}$ in reading, and $\frac{1}{24}$ in learning music. What part of his time is employed in other ways?

14. A pole is standing in a pond ; $\frac{1}{2}$ of it is in the air, and $\frac{1}{3}$ in the water. What part is in the earth ?

15. A student devotes $\frac{1}{4}$ of his time to sleep, $\frac{1}{3}$ to study, $\frac{1}{24}$ to reading, $\frac{1}{8}$ to exercise, and $\frac{1}{12}$ to deeds of charity. What part of his time is otherwise employed ?

16. After spending $\frac{1}{2}$ and $\frac{1}{3}$ of my money, and losing $\frac{1}{12}$, I had \$8 remaining. How much had I at first ?

LESSON XLI

Find the value of:

- | | | |
|---|--|---|
| 1. $\frac{1}{2} + \frac{1}{4} - \frac{1}{8}$ | $\frac{7}{8} - \frac{3}{4} + \frac{3}{16}$ | $4\frac{3}{8} - 2\frac{3}{4} + 3\frac{1}{8}$ |
| 2. $\frac{1}{3} + \frac{1}{6} - \frac{1}{4}$ | $\frac{5}{6} - \frac{2}{3} + \frac{2}{9}$ | $5\frac{5}{7} - 3\frac{3}{14} + 8\frac{5}{14}$ |
| 3. $\frac{1}{2} + \frac{1}{3} - \frac{1}{8}$ | $\frac{5}{8} - \frac{1}{4} + \frac{1}{16}$ | $7\frac{5}{6} - 4\frac{2}{3} + 9\frac{5}{6}$ |
| 4. $\frac{1}{4} + \frac{1}{8} - \frac{1}{16}$ | $\frac{6}{7} - \frac{3}{14} + \frac{5}{7}$ | $8\frac{4}{5} + 9\frac{3}{10} - 5\frac{3}{5}$ |
| 5. $\frac{3}{5} + \frac{1}{5} - \frac{3}{4}$ | $\frac{3}{4} - \frac{3}{8} + \frac{1}{12}$ | $12\frac{1}{2} + 8\frac{5}{16} - 4\frac{3}{4}$ |
| 6. $\frac{5}{6} + \frac{3}{4} - \frac{1}{3}$ | $\frac{4}{5} - \frac{3}{10} + \frac{2}{15}$ | $15\frac{1}{3} + 3\frac{1}{9} - 3\frac{2}{3}$ |
| 7. $\frac{4}{7} + \frac{1}{2} - \frac{1}{4}$ | $\frac{8}{9} - \frac{5}{18} + \frac{1}{2}$ | $18\frac{1}{2} - 12\frac{3}{4} - 3\frac{3}{16}$ |
| 8. $\frac{3}{8} + \frac{1}{4} - \frac{3}{16}$ | $\frac{9}{10} - \frac{2}{5} + \frac{1}{20}$ | $19\frac{4}{9} - 10\frac{2}{3} + 4\frac{4}{9}$ |
| 9. $\frac{2}{9} + \frac{1}{3} - \frac{1}{9}$ | $\frac{2}{3} - \frac{5}{9} + \frac{5}{6}$ | $25\frac{7}{10} + 5\frac{3}{5} + 6\frac{3}{10}$ |
| 10. $\frac{3}{10} + \frac{2}{5} - \frac{2}{10}$ | $\frac{11}{12} - \frac{5}{36} + \frac{5}{9}$ | $16\frac{5}{12} + 9\frac{5}{6} - 8\frac{5}{36}$ |

LESSON XLII

1. A mother gave each of her 3 children $\frac{1}{2}$ an orange. How many oranges did it take ?

SOLUTION.—It took 3 times $\frac{1}{2}$ an orange, which are $\frac{3}{2}$. $\frac{3}{2} = 1\frac{1}{2}$ oranges.

2. John fed 5 horses, giving to each $\frac{1}{2}$ a peck of oats. How many pecks did it take ?

3. James gave $\frac{1}{3}$ of an orange to each of his 4 sisters. How many did it take ?

4. John gave $\frac{2}{3}$ of a pineapple to each of his 2 brothers. How many did he give to both ?

5. What are 4 times $\frac{2}{3}$?

SOLUTION. — 4 times $\frac{2}{3}$ are $\frac{8}{3} = 2\frac{2}{3}$.

6. Philip gave $\frac{1}{4}$ of an apple to each of his 6 playmates. How many apples did it take?

7. Charles gave $\frac{3}{4}$ of a pint of chestnuts to each of his 2 brothers. How many pints did it take?

8. Mary gave $\frac{3}{4}$ of an orange to each of her 3 brothers. How many oranges did it take?

Find the value of:

9. $6 \times \frac{3}{4}$	$7 \times \frac{3}{4}$	$8 \times \frac{3}{4}$	$4 \times \frac{2}{5}$
10. $3 \times \frac{1}{5}$	$5 \times \frac{2}{5}$	$6 \times \frac{3}{5}$	$5 \times \frac{3}{8}$
11. $3 \times \frac{1}{7}$	$4 \times \frac{2}{7}$	$5 \times \frac{4}{7}$	$6 \times \frac{5}{9}$
12. $5 \times \frac{1}{8}$	$2 \times \frac{3}{8}$	$4 \times \frac{7}{8}$	$7 \times \frac{4}{5}$
13. $2 \times \frac{1}{9}$	$4 \times \frac{2}{9}$	$5 \times \frac{4}{9}$	$9 \times \frac{2}{11}$
14. $8 \times \frac{3}{9}$	$6 \times \frac{6}{9}$	$7 \times \frac{8}{9}$	$8 \times \frac{5}{6}$
15. $5 \times \frac{7}{6}$	$8 \times \frac{3}{5}$	$9 \times \frac{2}{5}$	$10 \times \frac{7}{5}$
16. $7 \times \frac{5}{8}$	$6 \times \frac{7}{9}$	$8 \times \frac{3}{7}$	$11 \times \frac{3}{2}$
17. $3 \times \frac{5}{4}$	$4 \times \frac{6}{5}$	$6 \times \frac{8}{7}$	$12 \times \frac{8}{7}$
18. $7 \times \frac{5}{8}$	$8 \times \frac{5}{2}$	$9 \times \frac{4}{3}$	$10 \times \frac{7}{4}$

LESSON XLIII

1. If 3 bushels of corn cost 45 cents, how much will 2 bushels cost?

SOLUTION. — 2 bushels will cost $\frac{2}{3}$ as much as 3 bushels; $\frac{2}{3}$ of 45 cents = 30 cents.

2. If 3 barrels of apples cost \$9, how much will 2 barrels cost?

3. If 3 yards of silk cost \$12, how much will 2 yards cost?

4. If 4 barrels of apples cost \$9, how much will 2 barrels cost?

5. If 5 apples cost 2 cents, how much will 10 apples cost?

6. Charles bought 12 marbles for 4 cents. How much would 3 of these marbles cost?

7. William bought 6 pints of milk for 18 cents; at that rate how much did 4 pints cost?

8. If 4 pounds of cheese sell for 30 cents, how much should 2 pounds sell for?

9. What are $\frac{3}{4}$ of 9?

SOLUTION. — $\frac{1}{4}$ of 9 is $\frac{9}{4}$; hence, $\frac{3}{4}$ of 9 are 3 times $\frac{9}{4}$, which are $\frac{27}{4} = 6\frac{3}{4}$.

What are :

10. $\frac{4}{5}$ of 6? 7? 8? 9? $\frac{3}{4}$ of 5? 4? 9? 7?

11. $\frac{5}{6}$ of 5? 7? 10? 11? $\frac{2}{3}$ of 11? 12? 10? 9?

12. $\frac{6}{7}$ of 8? 9? 10? 11? $\frac{5}{12}$ of 8? 7? 9? 4?

13. $\frac{7}{8}$ of 5? 7? 9? 11? $\frac{5}{8}$ of 16? 10? 12? 8?

14. $\frac{8}{9}$ of 6? 7? 8? 10? $\frac{7}{9}$ of 12? 8? 18? 36?

15. $\frac{9}{10}$ of 6? 8? 9? 11? $\frac{7}{12}$ of 10? 9? 7? 24?

16. $\frac{10}{11}$ of 3? 5? 8? 9? $\frac{8}{11}$ of 22? 44? 33? 66?

17. $\frac{11}{12}$ of 7? 8? 9? 10? $\frac{9}{12}$ of 36? 60? 24? 48?

18. If 4 men perform a piece of work in 8 days, how long will it take 5 men?

SOLUTION. — It will take 1 man 4 times 8 days = 32 days; hence, it will take 5 men $\frac{1}{5}$ of 32 days = $6\frac{4}{5}$ days.

19. If one barrel of flour lasts 8 persons 20 days, how long will it last 11 persons?

20. If 7 men can do a piece of work in 5 days, how long will it take 8 men?

21. If 2 men build a wall in 12 days, how long will it take 7 men?

22. If it requires 11 days, of 8 hours each, to do a certain work, how many days, of 10 hours each, will be required to accomplish it?

23. A man paid 37 cents for riding 8 miles by stage. At the same rate, how much will it cost to ride 11 miles?

24. If 2 pipes of a certain size empty a cistern in 17 minutes, in what time will 3 pipes empty it?

25. If 18 bushels of oats last 5 horses one week, how many bushels will 7 horses require?

26. If a laborer receives 5 bushels of wheat for 7 days' work, how much should he receive for 11 days' work?

27. If a carpenter earns \$8 in 3 days, how much will he earn in 9 days?

28. A pole, 18 feet long, is two sevenths in the earth, the rest in the air. What is the length of each part?

29. Three men earned \$15. A earned $\frac{2}{5}$, B $\frac{1}{3}$, and C the rest. What was the share of each?

30. If 3 dozen buttons cost 36 cents, how much should be charged for $\frac{2}{3}$ of a dozen?

31. A watchmaker sold a watch for \$18 and lost $\frac{2}{5}$ of its cost. How much did he lose?

SOLUTION.—\$18 was $\frac{3}{5} - \frac{2}{5} = \frac{1}{5}$ of the cost. Therefore $\frac{1}{5}$ of the cost was \$6, and $\frac{2}{5}$ of the cost, or the loss, was \$12.

32. A watchmaker sold a watch for \$45, and gained $\frac{2}{7}$ of its cost. What was its cost?

SOLUTION.—\$45 was $\frac{7}{7} + \frac{2}{7} = \frac{9}{7}$ of the cost. Therefore the cost was \$35.

LESSON XLIV

1. Robert gave $1\frac{1}{2}$ oranges to each of his 2 sisters. How many oranges did it take?

SOLUTION.— $1\frac{1}{2} = \frac{3}{2}$. It took 2 times $\frac{3}{2}$ oranges, which are $\frac{3}{2} \times 2 = 3$ oranges.

2. How many are 3 times $2\frac{1}{2}$?

SOLUTION.— $2\frac{1}{2} = \frac{5}{2}$. 3 times $\frac{5}{2}$ are $\frac{15}{2} = 7\frac{1}{2}$.

3. How long are 2 lines each of which is $1\frac{1}{3}$ inches long?

4. How many are 3 times $1\frac{1}{3}$? 2 times $2\frac{2}{3}$?

5. How many are 3 times $3\frac{1}{3}$? 4 times $4\frac{1}{2}$?

6. How many are 5 times $2\frac{3}{4}$? 6 times $3\frac{3}{4}$?
 7. How many are 8 times $3\frac{1}{4}$? 9 times $4\frac{3}{8}$?
 8. How many yards are there in 3 remnants of silk each $1\frac{1}{4}$ yards long? In 4 remnants?
 9. How many are 5 times $1\frac{1}{4}$? 6 times $1\frac{1}{4}$?
 10. How many are 2 times $1\frac{3}{4}$? 3 times $2\frac{1}{4}$?
 11. How many are 4 times $3\frac{1}{4}$? 5 times $3\frac{3}{4}$?
 12. How many are 6 times $3\frac{1}{4}$? 8 times $3\frac{3}{4}$?
 13. How many are 7 times $2\frac{1}{4}$? 9 times $2\frac{3}{4}$?
 14. How many are 10 times $1\frac{3}{4}$? 10 times $3\frac{1}{4}$?
 15. How many are 12 times $3\frac{3}{4}$?

SOLUTION.—12 times 3 = 36; 12 times $\frac{3}{4} = \frac{36}{4} = 9$; $36 + 9 = 45$.

16. If a family consumes $3\frac{1}{2}$ barrels of flour in one month, how much will they require for 3 months?

17. If a man does a piece of work in $8\frac{1}{2}$ days, how long will it take him to do 6 times as much work?

18. If a boy earns \$6 a week, how much will he earn in $5\frac{5}{8}$ weeks?

Find the value of:

- | | | |
|-----------------------------|-----------------------------|--------------------------------|
| 19. $4 \times 3\frac{2}{5}$ | 31. $5 \times 4\frac{2}{5}$ | 43. $5 \times 9\frac{2}{3}$ |
| 20. $2 \times 6\frac{3}{5}$ | 32. $4 \times 6\frac{1}{5}$ | 44. $7 \times 9\frac{3}{8}$ |
| 21. $6 \times 4\frac{1}{5}$ | 33. $5 \times 6\frac{1}{2}$ | 45. $2 \times 10\frac{3}{10}$ |
| 22. $7 \times 4\frac{2}{5}$ | 34. $6 \times 6\frac{3}{5}$ | 46. $5 \times 10\frac{3}{5}$ |
| 23. $9 \times 1\frac{1}{5}$ | 35. $7 \times 6\frac{5}{8}$ | 47. $6 \times 10\frac{1}{5}$ |
| 24. $5 \times 3\frac{3}{5}$ | 36. $4 \times 7\frac{2}{7}$ | 48. $9 \times 10\frac{7}{10}$ |
| 25. $6 \times 3\frac{4}{5}$ | 37. $5 \times 7\frac{4}{7}$ | 49. $10 \times 9\frac{3}{8}$ |
| 26. $8 \times 3\frac{2}{5}$ | 38. $6 \times 7\frac{6}{7}$ | 50. $12 \times 11\frac{2}{11}$ |
| 27. $9 \times 3\frac{1}{5}$ | 39. $4 \times 8\frac{3}{8}$ | 51. $6 \times 9\frac{5}{8}$ |
| 28. $3 \times 2\frac{4}{5}$ | 40. $5 \times 8\frac{1}{2}$ | 52. $7 \times 7\frac{3}{5}$ |
| 29. $3 \times 4\frac{1}{2}$ | 41. $6 \times 8\frac{7}{8}$ | 53. $11 \times 4\frac{10}{11}$ |
| 30. $4 \times 4\frac{3}{4}$ | 42. $3 \times 9\frac{5}{8}$ | 54. $11 \times 10\frac{5}{8}$ |

LESSON XLV

1. A man who had bought 10 boxes of raisins, at $\$1\frac{1}{2}$ a box, exchanged them for flour, at $\$4$ a barrel. How many barrels did it take?

SOLUTION.—The raisins cost 10 times $\$1\frac{1}{2} = \16 ; it took as many barrels of flour to pay for them as $\$4$ are contained times in $\$16$, which are 4.

2. A man walked for 6 hours, going $4\frac{2}{3}$ miles an hour. The next day he returned the same distance, going 5 miles an hour. How long did it take him?

3. A dealer sold 8 tables at $\$5\frac{1}{4}$ each, and with the money bought coal at $\$6$ a ton. How many tons did he get?

4. Five times $5\frac{2}{3}$ are how many times 6?

SOLUTION.—5 times $5\frac{2}{3} = 28$; $28 \div 6 = 4\frac{2}{3}$.

5. Four times $4\frac{3}{4}$ are how many times 3? 5? 6? 8? 9?

6. Six times $6\frac{5}{6}$ are how many times 4? 5? 7? 8? 9?

7. Five times $5\frac{2}{3}$ are how many times 4? 6? 8? 9? 10?

8. Eight times $8\frac{1}{8}$ are how many times 5? 6? 7? 9?

9. Seven times $6\frac{2}{7}$ are how many times 5? 8? 9? 10?

10. Ten times $5\frac{2}{5}$ are how many times 6? 7? 8? 9? 10?

11. Eight times $8\frac{3}{8}$ are how many times 6? 7? 9? 10?

12. Seven times $7\frac{4}{7}$ are how many times 5? 6? 8? 9?

13. Five times $5\frac{4}{5}$ are how many times 6? 7? 8? 9? 10?

14. Nine times $6\frac{1}{3}$ are how many times 5? 7? 8? 10? 11?

15. Seven times $7\frac{2}{7}$ are how many times 5? 6? 9? 10?

Find the value of:

16. $(4\frac{2}{3} \times 3) \div 7$

21. $(8\frac{2}{3} \times 9) \div 7$

17. $(4\frac{4}{5} \times 5) \div 12$

22. $(4\frac{6}{7} \times 7) \div 6$

18. $(7\frac{5}{7} \times 7) \div 27$

23. $(5\frac{3}{4} \times 7) \div 6$

19. $(9\frac{2}{7} \times 7) \div 13$

24. $(10\frac{10}{11} \times 11) \div 12$

20. $(8\frac{1}{8} \times 6) \div 7$

25. $(5\frac{5}{12} \times 12) \div 5$

LESSON XLVI

1. Mildred, having $\frac{1}{2}$ an orange, gave her brother $\frac{1}{2}$ of what she had. What part of an orange did she give him?

SOLUTION.—She gave to her brother $\frac{1}{2}$ of $\frac{1}{2}$ an orange, which is $\frac{1}{4}$ of an orange.

2. Herbert divided $\frac{1}{3}$ of an apple equally between his brothers. What part did each receive?

3. If $\frac{1}{4}$ of an orange is divided into 2 equal parts, what is 1 of the parts called?

4. If $\frac{1}{3}$ of a circle is divided into 3 equal parts, what part of the circle will each part be?

5. If $\frac{1}{2}$ of a line is divided into 5 equal parts, what is each part called?

6. If you divide an orange into 4 equal parts, and cut each part into 3 equal pieces, what will 1 piece be called?

What single fraction equals:

7. $\frac{1}{2}$ of $\frac{1}{4}$?

SOLUTION.— $\frac{1}{2}$ of $\frac{1}{4} = \frac{1}{8}$.

8. $\frac{1}{3}$ of $\frac{1}{5}$? $\frac{1}{4}$ of $\frac{1}{4}$? $\frac{1}{8}$ of $\frac{1}{6}$? $\frac{1}{4}$ of $\frac{1}{5}$? $\frac{1}{3}$ of $\frac{1}{7}$? $\frac{1}{2}$ of $\frac{1}{8}$?

9. $\frac{1}{4}$ of $\frac{1}{6}$? $\frac{1}{3}$ of $\frac{1}{8}$? $\frac{1}{5}$ of $\frac{1}{5}$? $\frac{1}{3}$ of $\frac{1}{9}$? $\frac{1}{4}$ of $\frac{1}{7}$? $\frac{1}{6}$ of $\frac{1}{6}$?

10. $\frac{1}{4}$ of $\frac{1}{8}$? $\frac{1}{5}$ of $\frac{1}{7}$? $\frac{1}{6}$ of $\frac{1}{6}$? $\frac{1}{7}$ of $\frac{1}{7}$? $\frac{1}{8}$ of $\frac{1}{8}$? $\frac{1}{9}$ of $\frac{1}{9}$?

11. Edward has $\frac{3}{4}$ of an apple, and wishes to give his brother $\frac{1}{2}$ of what he has. What part of the whole apple must he give him?

SOLUTION.—He must give him $\frac{1}{2}$ of $\frac{3}{4}$ of an apple; $\frac{1}{2}$ of $\frac{3}{4} = \frac{3}{8}$; $\frac{1}{2}$ of $\frac{3}{4}$ is 3 times $\frac{1}{8} = \frac{3}{8}$.

12. George has $\frac{3}{5}$ of a melon to divide equally between his brother and sister. How must he divide it, and what part of the whole will each receive?

13. What is $\frac{1}{3}$ of $\frac{2}{5}$?

SOLUTION.— $\frac{1}{3}$ of $\frac{2}{5} = \frac{2}{15}$; $\frac{1}{3}$ of $\frac{2}{5} = \frac{2}{15}$.

14. What is $\frac{1}{8}$ of $\frac{5}{6}$? $\frac{1}{4}$ of $\frac{3}{4}$? $\frac{1}{5}$ of $\frac{5}{6}$? $\frac{1}{6}$ of $\frac{3}{4}$?

15. What is $\frac{1}{6}$ of $\frac{4}{7}$? $\frac{1}{7}$ of $\frac{5}{8}$? $\frac{1}{8}$ of $\frac{5}{7}$? $\frac{1}{7}$ of $\frac{4}{6}$?

16. What is $\frac{1}{3}$ of $\frac{4}{9}$? $\frac{1}{9}$ of $\frac{5}{9}$? $\frac{1}{10}$ of $\frac{7}{9}$? $\frac{1}{11}$ of $\frac{8}{9}$?

17. Edward has $\frac{4}{5}$ of a melon, and gives his sister $\frac{2}{5}$ of what he has. What part of the melon does she receive?

SOLUTION. — She receives $\frac{2}{5}$ of $\frac{4}{5}$ of a melon. $\frac{1}{5}$ of $\frac{4}{5}$ is $\frac{4}{25}$; $\frac{2}{5}$ of $\frac{4}{5}$ are 2 times $\frac{4}{25} = \frac{8}{25}$.

18. What are $\frac{2}{3}$ of $\frac{3}{4}$?

SOLUTION. — $\frac{1}{3}$ of $\frac{3}{4}$ is $\frac{1}{4}$; $\frac{2}{3}$ of $\frac{3}{4}$ are $\frac{2}{4} = \frac{1}{2}$.

19. What are $\frac{2}{3}$ of $\frac{3}{5}$? $\frac{3}{4}$ of $\frac{6}{5}$? $\frac{2}{3}$ of $\frac{5}{6}$? $\frac{3}{4}$ of $\frac{7}{8}$?

20. What are $\frac{2}{3}$ of $\frac{3}{8}$? $\frac{2}{3}$ of $\frac{3}{7}$? $\frac{5}{6}$ of $\frac{4}{7}$? $\frac{2}{3}$ of $\frac{7}{10}$?

21. What are $\frac{2}{5}$ of $\frac{8}{9}$? $\frac{2}{7}$ of $\frac{5}{11}$? $\frac{3}{8}$ of $\frac{5}{7}$? $\frac{5}{7}$ of $\frac{4}{9}$?

22. What are $\frac{2}{2}$ of $\frac{5}{6}$? $\frac{6}{5}$ of $\frac{2}{9}$? $\frac{9}{10}$ of $\frac{7}{6}$? $\frac{7}{8}$ of $\frac{4}{3}$?

23. A person, owning $\frac{3}{4}$ of a ship, sold $\frac{5}{6}$ of his share. What part of the ship did he sell?

24. A banker, owning $\frac{4}{5}$ of the entire stock of a bank, sold $\frac{2}{3}$ of his share. What part of the stock did he sell?

25. If a man sells $\frac{2}{3}$ of $\frac{7}{10}$ of his stock of merchandise, what amount does he sell?

LESSON XLVII

1. If one yard of cloth is worth $2\frac{1}{2}$ bushels of wheat, how much is $\frac{1}{2}$ a yard worth?

SOLUTION. — $2\frac{1}{2} = \frac{5}{2}$; $\frac{1}{2}$ of $\frac{5}{2} = \frac{5}{4}$, or $1\frac{1}{4}$ bushels.

What single fraction will represent:

2. $\frac{1}{3}$ of $2\frac{1}{2}$? $\frac{1}{2}$ of $1\frac{1}{4}$? $\frac{1}{3}$ of $1\frac{3}{4}$? $\frac{1}{4}$ of $2\frac{1}{5}$? $\frac{1}{5}$ of $3\frac{1}{4}$?

3. $\frac{1}{6}$ of $4\frac{2}{3}$? $\frac{1}{7}$ of $5\frac{1}{6}$? $\frac{2}{3}$ of $1\frac{1}{2}$? $\frac{3}{4}$ of $1\frac{2}{3}$? $\frac{2}{7}$ of $1\frac{1}{3}$?

4. $\frac{2}{5}$ of $4\frac{1}{3}$? $\frac{3}{5}$ of $2\frac{2}{7}$? $\frac{5}{8}$ of $3\frac{1}{2}$? $\frac{3}{8}$ of $2\frac{1}{8}$? $\frac{3}{7}$ of $4\frac{5}{9}$?

5. If 3 yards of cloth cost \$1 $\frac{4}{5}$, find the cost of 2 yards.

6. If 3 yards of velvet cost \$5 $\frac{2}{3}$, how much will 2 yards cost?

7. If 5 gallons of molasses cost \$2 $\frac{1}{2}$, how much will 3 gallons cost?

8. If 7 pounds of tea cost \$6 $\frac{2}{10}$, how much will 4 pounds cost?

9. If 4 pounds of butter cost $\$1\frac{1}{4}$, how much will 7 pounds cost?

10. If 7 yards of cloth cost $\$5\frac{3}{8}$, what will be the cost of 3 yards? Of 4 yards?

11. I walk 2 hours at $4\frac{2}{3}$ miles an hour. How long will it take me to return at 5 miles an hour?

12. If 5 gallons of olive oil cost $\$2\frac{3}{4}$, how much will 7 gallons cost?

13. If 3 gallons of French vinegar cost $\$3\frac{3}{4}$, what will be the cost of 8 gallons? Of 10 gallons?

14. A man can perform a piece of work in $3\frac{3}{4}$ days, of 10 hours each. How many days, of 7 hours each, will it take?

15. If a man can do a piece of work in $14\frac{2}{3}$ days, working 5 hours a day, how many days will it take, working 8 hours a day?

LESSON XLVIII

1. A man, by selling a horse for $\$45$, gained $\frac{1}{8}$ of the cost. What was the cost?

SOLUTION. — $\$45$ are $\frac{1}{8} + \frac{1}{8} = \frac{2}{8}$ of the cost; hence $\frac{1}{8}$ of the cost is $\frac{1}{2}$ of $\$45 = \5 , and the cost is 8 times $\$5 = \40 .

2. Philip gave his brother 4 marbles, which were $\frac{2}{3}$ of all he had. How many had he?

3. George sold a knife for 15 cents, which was $\frac{3}{8}$ of its cost. How much did it cost?

4. William gave away 6 marbles, which were $\frac{3}{8}$ of all he had. How many had he?

5. I sold a horse for $\$42$, which was $\frac{7}{8}$ of its cost. What was its cost?

6. A grocer sold a lot of flour for $\$40$, which was $\frac{5}{8}$ of the cost. What was the cost?

7. A man sold a horse for $\$56$, which was $\frac{8}{9}$ of the cost. What was the cost?

8. A man sold a watch for \$28, which was $\frac{4}{5}$ of its cost. What was its cost?

9. A man sold a pony for \$45, which was $\frac{5}{8}$ of its cost. What was the cost?

10. A man purchased a horse. After paying $\frac{3}{4}$ of the price, he owed \$20. What was the price of the horse? How much money did he pay?

11. A boy sold a book for 25 cents, and lost $\frac{2}{5}$ of the cost. What was the cost?

12. In an orchard there are 12 cherry trees. The remaining $\frac{5}{7}$ of the orchard are apple trees. How many trees are there in the orchard?

13. Four fifths of a stick is under water, and 6 feet are out of water. How long is the stick?

14. There is a pole, $\frac{3}{5}$ of which is in the earth, and 12 feet are in the air. How long is the pole?

15. A piece of timber stands $\frac{4}{5}$ in the air, and 5 feet in the ground. How long is the entire piece?

16. $\frac{1}{5}$ of a pole is in the mud, $\frac{2}{5}$ is in the water, and 14 feet are in the air. How long is the pole?

17. A man gave to some poor persons \$4, which was $\frac{2}{5}$ of his money. How much had he left?


18. At \$8 a yard, $\frac{1}{5}$ of the cost of a piece of cloth was lost. What was the cost?

19. If $\frac{3}{5}$ of the cost of a horse was \$64, and it was bought with the money received for flour, at \$4 a barrel, how many barrels were sold?

20. If $\frac{7}{9}$ of a boy's monthly salary is \$42, how many weeks' board at \$8 a week can he pay with it?

21. If $\frac{4}{5}$ of a line is 8 inches, how many times the line is 25 inches?

22. If $\frac{3}{5}$ of a certain distance is 4 miles, how many times the distance is 12 miles?



23. By selling 5 yards of cloth for \$12, I gained $\frac{1}{3}$ of the cost. How much did I pay per yard?

24. If $\frac{3}{4}$ of a pound of raisins costs 9 cents, how many times 2 cents will pay for a pound?

25. If $\frac{2}{3}$ of John's money is 16 cents, how many pencils at 4 cents each can he buy for it?

26. Charles has 42 cents, which is $\frac{7}{8}$ of the amount James has. How many oranges at 6 cents each can James buy for his money?

27. If $\frac{3}{5}$ of my money is \$12, how many birthday gifts at \$10 each can I get for it?

28. A man sold a horse for \$50, which was $\frac{5}{8}$ of its cost. He paid for it with \$10 bills. How many did it take?

LESSON XLIX

1. 12 is $\frac{4}{5}$ of how many times 5?

SOLUTION. — 12 is $\frac{4}{5}$ of 21; $21 \div 5 = 4\frac{1}{5}$.

2. 18 is $\frac{3}{8}$ of how many times 6?

3. 16 is $\frac{2}{7}$ of how many times 8?

4. 36 is $\frac{4}{7}$ of how many times 7?

5. 45 is $\frac{5}{8}$ of how many times 9?

6. 24 is $\frac{4}{5}$ of how many times 6?

7. 72 is $\frac{8}{9}$ of how many times 5?

8. 81 is $\frac{9}{4}$ of how many times 3?

9. 50 is $\frac{10}{7}$ of how many times 7?

10. 63 is $\frac{7}{6}$ of how many times 9?

11. 56 is $\frac{8}{3}$ of how many times 7?

12. A man, having 12 bushels of grain, divided $\frac{5}{8}$ of it equally among 3 poor persons. How many bushels did each receive?

SOLUTION. — $\frac{5}{8}$ of 12 bushels = 10 bushels. Each person received $\frac{1}{3}$ of 10 bushels = $3\frac{1}{3}$ bushels.

13. A boy, having 25 apples, kept $\frac{1}{5}$ himself, and divided the other $\frac{4}{5}$ equally among 5 companions. How many did each receive?

14. $\frac{3}{4}$ of 24 are how many times 9?

SOLUTION. — $\frac{3}{4}$ of 24 = 18; $18 \div 9 = 2$.

15. $\frac{7}{8}$ of 24 are how many times 7?

16. $\frac{2}{3}$ of 18 are how many times 6?

17. $\frac{7}{8}$ of 27 are how many times 10?

18. $\frac{3}{5}$ of 60 are how many times 7?

19. $\frac{5}{6}$ of 66 are how many times 8?

20. $\frac{5}{8}$ of 48 are how many times 9?

21. $\frac{3}{7}$ of 56 are how many times 9?

22. $\frac{2}{7}$ of 63 are how many times 10?

23. $\frac{5}{8}$ of 64 are how many times 6?

24. $\frac{5}{8}$ of 40 are how many times 5?

25. $\frac{11}{7}$ of 49 are how many times 8?

26. $\frac{5}{6}$ of 54 are how many times 7?

27. $\frac{10}{9}$ of 63 are how many times 8?

28. $\frac{8}{9}$ of 54 are how many times 5?

29. $\frac{2}{7}$ of 42 are how many times 8?

30. $\frac{7}{11}$ of 55 are how many times 6?

31. $\frac{3}{4}$ of 72 are how many times 10?

32. $\frac{2}{3}$ of 96 are how many times 11?

LESSON L

1. At $\$ \frac{1}{2}$ a yard, how much cloth can be bought for $\$ \frac{1}{4}$?

SOLUTION. — For \$1, 2 times 1 yard = 2 yards can be bought; hence, for $\$ \frac{1}{4}$, $\frac{1}{4}$ of 2 yards = $\frac{1}{2}$ of a yard can be bought.

2. At $\$ \frac{1}{8}$ a yard, how much ribbon can be purchased for $\$ \frac{1}{4}$?

3. At $\$ \frac{1}{2}$ a yard, how much alpaca can be purchased for $\$ \frac{3}{4}$?

4. At $\$ \frac{1}{2}$ a bushel, how much corn can be bought for $\$ \frac{3}{4}$?

5. At $\$ \frac{3}{8}$ a yard, how much lawn can be bought for $\$ \frac{3}{4}$?

6. If a pound of coffee is worth $\$ \frac{2}{5}$, how much can John buy for $\$ \frac{1}{2}$?

SOLUTION. — For $\$ \frac{1}{5}$, $\frac{1}{2}$ a pound can be bought, and for $\$ 1$, $\frac{1}{2}$ pounds. Hence, for $\$ \frac{1}{2}$, $\frac{1}{2}$ of $\frac{1}{2} = \frac{1}{4} = 1\frac{1}{4}$ pounds can be bought.

7. If a pound of tea costs $\$ \frac{4}{5}$, how much tea can you purchase for $\$ \frac{3}{4}$?

8. One bushel of rye is worth $\frac{3}{4}$ of a bushel of wheat. How much rye is worth $\frac{4}{5}$ of a bushel of wheat? How much is worth 1 bushel?

9. Divide $\frac{1}{5}$ by $\frac{1}{4}$.

SOLUTION. — $\frac{1}{5}$ divided by $\frac{1}{4}$ is 4 times $\frac{1}{5} = \frac{4}{5}$.

10. Divide $\frac{1}{6}$ by $\frac{1}{5}$. By $\frac{1}{4}$. By $\frac{1}{3}$.

11. Divide $\frac{1}{7}$ by $\frac{1}{6}$. By $\frac{1}{5}$. By $\frac{1}{4}$.

12. Divide $\frac{1}{8}$ by $\frac{1}{7}$. By $\frac{1}{6}$. By $\frac{1}{5}$.

13. Divide $\frac{4}{5}$ by $\frac{2}{3}$.

SOLUTION. — $\frac{4}{5} \div \frac{1}{3} = 1\frac{2}{5}$; $\frac{4}{5} \div \frac{2}{3} = \frac{1}{2}$ of $1\frac{2}{5}$, which is $\frac{3}{5} = 1\frac{1}{5}$.

14. Divide $\frac{4}{5}$ by $\frac{3}{4}$.

15. Divide $\frac{5}{6}$ by $\frac{4}{5}$. By $\frac{3}{4}$. By $\frac{2}{3}$.

16. Divide $\frac{6}{7}$ by $\frac{5}{6}$. By $\frac{4}{5}$. By $\frac{3}{4}$.

17. Divide $\frac{7}{8}$ by $\frac{6}{7}$. By $\frac{5}{6}$. By $\frac{4}{5}$.

18. Divide $\frac{7}{8}$ by $\frac{3}{4}$.

SOLUTION. — $\frac{7}{8} \div \frac{3}{4}$ is the same as $\frac{7}{8} \times \frac{4}{3} = \frac{7}{6}$, or $1\frac{1}{6}$.

19. Divide $\frac{8}{9}$ by $\frac{7}{8}$. By $\frac{6}{7}$. By $\frac{5}{6}$.

20. Divide $\frac{9}{10}$ by $\frac{8}{9}$. By $\frac{7}{8}$. By $\frac{6}{7}$.

21. Divide $\frac{10}{11}$ by $\frac{9}{10}$. By $\frac{8}{9}$. By $\frac{7}{8}$.

Find the value of:

22. $\frac{11}{12} \div \frac{10}{11}$

$\frac{3}{14} \div \frac{2}{28}$

$\frac{4}{8} \div \frac{8}{9}$

$\frac{11}{10} \div \frac{11}{12}$

23. $\frac{6}{5} \div \frac{2}{3}$

$\frac{5}{12} \div \frac{6}{24}$

$\frac{8}{8} \div \frac{3}{4}$

$\frac{12}{11} \div \frac{7}{8}$

24. $\frac{7}{6} \div \frac{3}{4}$

$\frac{5}{16} \div \frac{7}{16}$

$\frac{9}{8} \div \frac{6}{9}$

$\frac{8}{8} \div \frac{8}{6}$

25. $\frac{11}{12} \div \frac{9}{10}$

$\frac{4}{11} \div \frac{8}{11}$

$\frac{11}{12} \div \frac{8}{9}$

$\frac{7}{4} \div \frac{7}{8}$

26. $\frac{8}{7} \div \frac{4}{5}$

$\frac{10}{18} \div \frac{5}{26}$

$\frac{10}{9} \div \frac{10}{11}$

$\frac{11}{8} \div \frac{6}{6}$

LESSON LI

1. If I divide a line measuring $10\frac{3}{4}$ inches into 6 equal parts, how much will each part measure?

SOLUTION. — $10\frac{3}{4} = \frac{43}{4}$. Each part measures $\frac{1}{6}$ of $\frac{43}{4}$ inches, which is $\frac{43}{24}$, or $1\frac{19}{24}$ inches.

2. If $2\frac{4}{5}$ is divided by 7, what will be the result?

3. How many times is 6 contained in $3\frac{3}{8}$?

4. How many times is 9 contained in $6\frac{3}{4}$?

5. Divide $8\frac{3}{4}$ by 5. $7\frac{3}{4}$ by 10.

6. Divide $4\frac{5}{7}$ by 11. $8\frac{4}{7}$ by 12.

7. If $1\frac{1}{2}$ yards of ribbon cost 6 cents, how much will 1 yard cost?

SOLUTION. — $1\frac{1}{2} = \frac{3}{2}$. $\frac{3}{2}$ a yard costs $\frac{1}{2}$ of 6 cents = 2 cents; hence, 1 yard costs 2 times 2 cents = 4 cents.

8. If $1\frac{1}{3}$ times a certain distance is 4 miles, what is the distance?

9. If a man travels 9 miles in $1\frac{3}{4}$ hours, how far will he travel in 1 hour?

10. A watch was sold for \$18, which equaled $1\frac{1}{5}$ times what it cost me. How much did it cost?

11. A grocer sold a lot of flour for \$25, which was $1\frac{1}{4}$ times the cost. How much did it cost? How much did he gain?

12. If a man pays \$6 for a remnant of cloth containing $1\frac{1}{3}$ yards, what is the cost of 1 yard?

13. If a man receives \$10 for $2\frac{3}{8}$ days' work, how much is that a day?

14. If a man receives \$12 for $6\frac{3}{8}$ days' work, how much is that a day?

Find the value of:

$$15. \quad 9 \div 3\frac{3}{4} \qquad 2\frac{2}{3} \div 4 \qquad 7 \div \frac{5}{8} \qquad 6\frac{1}{4} \div 5$$

$$16. \quad 10 \div 2\frac{1}{7} \qquad 9\frac{4}{9} \div 5 \qquad 63 \div \frac{7}{8} \qquad 7\frac{3}{8} \div 11$$

$$17. \quad 11 \div 4\frac{8}{9} \qquad 2\frac{1}{5} \div 2 \qquad 72 \div \frac{8}{9} \qquad 6\frac{3}{8} \div 18$$

LESSON LII

1. If a yard of ribbon costs $\$ \frac{3}{8}$, how many yards will cost $\$ 3 \frac{3}{4}$?

SOLUTION. — $3 \frac{3}{4} = \frac{15}{4}$. As many yards as $\frac{1}{4}$ are contained times in $\frac{15}{4}$, which are 10 times.

2. When a bushel of corn costs $\$ \frac{1}{2}$, how many bushels can you buy for $\$ 1 \frac{1}{2}$?

3. I distributed $2 \frac{2}{3}$ bushels of wheat among a number of persons, giving to each $\frac{2}{3}$ of a bushel. How many persons were there?

4. At $\$ \frac{1}{4}$ a yard, how many yards of alpaca can be purchased for $\$ 3 \frac{3}{4}$?

5. At $\$ \frac{3}{4}$ a yard, how many yards of cloth can be purchased for $\$ 3 \frac{1}{4}$?

6. How often is $\frac{3}{4}$ contained in $3 \frac{3}{4}$? In $5 \frac{1}{4}$?

7. How often is $\frac{2}{3}$ contained in $4 \frac{1}{3}$? In $8 \frac{2}{3}$?

8. How often is $1 \frac{1}{2}$ contained in $\frac{3}{4}$? In $\frac{1}{6}$? In $2 \frac{3}{4}$?

9. How often is $2 \frac{1}{4}$ contained in $\frac{5}{6}$? In $\frac{5}{7}$? In $3 \frac{1}{6}$?

10. How often is $3 \frac{1}{5}$ contained in $\frac{8}{3}$? In $\frac{3}{7}$? In $5 \frac{8}{5}$?

11. $5 \frac{1}{3}$ is $\frac{1}{2}$ of what number? $\frac{1}{5}$ of what number?

12. $7 \frac{3}{4}$ is $\frac{1}{3}$ of what number? $\frac{1}{7}$ of what number?

13. $9 \frac{2}{3}$ is $\frac{5}{8}$ of what number? $\frac{5}{6}$ of what number?

14. $4 \frac{2}{3}$ is $\frac{2}{5}$ of what number? $\frac{5}{6}$ of what number?

15. $3 \frac{2}{3}$ is $\frac{3}{4}$ of what number? $\frac{3}{5}$ of what number?

16. How often is $\frac{1}{6}$ contained in $3 \frac{5}{6}$? In $5 \frac{1}{6}$? In $4 \frac{5}{6}$?

17. How often is $\frac{2}{5}$ contained in $2 \frac{2}{5}$? In $4 \frac{2}{5}$? In $6 \frac{2}{5}$?

18. How often is $\frac{2}{7}$ contained in $3 \frac{2}{7}$? In $4 \frac{2}{7}$? In $7 \frac{2}{7}$?

19. How often is $\frac{5}{8}$ contained in $4 \frac{3}{4}$? In $5 \frac{3}{8}$? In $8 \frac{3}{4}$?

20. How often is $\frac{2}{3}$ contained in $2 \frac{3}{10}$? In $6 \frac{2}{11}$? In $9 \frac{5}{12}$? In $10 \frac{2}{3}$?

21. At $\$ \frac{2}{5}$ a gallon, how many gallons of vinegar can you buy for $\$ 2 \frac{2}{5}$? For $\$ 4 \frac{1}{5}$?

22. When one bushel of rye is worth $\frac{3}{4}$ of a bushel of wheat, how many bushels of rye are worth $4\frac{1}{2}$ bushels of wheat? $8\frac{1}{4}$ bushels?

LESSON LIII

The examples in this lesson are to be solved by using the following table, where applicable:

FRACTIONAL PARTS OF 100

$12\frac{1}{2} = \frac{1}{8}$ of 100	$25 = \frac{1}{4}$ of 100	$50 = \frac{1}{2}$ of 100	$75 = \frac{3}{4}$ of 100
$16\frac{2}{3} = \frac{1}{6}$ of 100	$33\frac{1}{3} = \frac{1}{3}$ of 100	$62\frac{1}{2} = \frac{5}{8}$ of 100	$83\frac{1}{3} = \frac{5}{6}$ of 100
$20 = \frac{1}{5}$ of 100	$37\frac{1}{2} = \frac{3}{8}$ of 100	$66\frac{2}{3} = \frac{2}{3}$ of 100	$87\frac{1}{2} = \frac{7}{8}$ of 100

1. How much will 16 pounds of soap cost, at $12\frac{1}{2}$ cents a pound?

SOLUTION. — $12\frac{1}{2}$ cents = $\frac{1}{8}$; 16 pounds will cost 16 times $\frac{1}{8}$ = $\frac{16}{8}$, or \$2.

2. How much money have I if $\frac{1}{12}$ of my money is $16\frac{2}{3}$ cents?

3. How much will 24 yards of alpaca cost, at $37\frac{1}{2}$ cents a yard?

4. How much will 16 yards of flannel cost, at $62\frac{1}{2}$ cents a yard?

5. How much will 15 pounds of coffee cost, at $33\frac{1}{3}$ cents a pound?

6. How much is 27 times $66\frac{2}{3}$ cents?

7. How much will 15 yards of cloth cost, at \$1.66 $\frac{2}{3}$ a yard?

8. Find the cost of 10 pounds of tea at $87\frac{1}{2}$ cents a pound.

9. If a man averages $83\frac{1}{3}$ cents an hour for his work, how much does he earn by working 6 hours?

10. At $\$1.12\frac{1}{2}$ a yard, find the cost of 8 yards of silk.

11. At $87\frac{1}{2}$ cents a yard, how much must I pay for 20 yards of matting?

12. If I paid $\$12$ for coffee, at $33\frac{1}{3}$ cents a pound, how many pounds did I buy?

SOLUTION. — $33\frac{1}{3}$ cents = $\$ \frac{1}{3}$. I bought as many pounds as $\frac{1}{3}$ is contained times in 12, which are 36.

13. I paid $\$1\frac{1}{4}$ for buttons, at $12\frac{1}{2}$ cents a dozen. How many dozen did I buy?

14. I paid $\$7\frac{1}{2}$ for flannel, at $62\frac{1}{2}$ cents a yard. How many yards did I buy?

15. How many times is $66\frac{2}{3}$ cents contained in $\$8$?

16. How many times is $83\frac{1}{3}$ cents contained in $\$10$?

17. Multiply 32 by $12\frac{1}{2}$.

SOLUTION. — $12\frac{1}{2} = \frac{1}{2}$ of 100; hence, $32 \times 12\frac{1}{2} = \frac{1}{2}$ of $32 \times 100 = 400$.

18. Multiply 18 by 50. 40 by $62\frac{1}{2}$. 68 by 75.

19. Multiply 48 by 75. 24 by $37\frac{1}{2}$. 51 by $33\frac{1}{3}$.

20. Multiply 39 by $66\frac{2}{3}$. 64 by $87\frac{1}{2}$. 96 by $62\frac{1}{2}$.

21. Multiply 30 by $83\frac{1}{3}$. 72 by 25. 16 by $16\frac{2}{3}$.

22. Divide 150 by $12\frac{1}{2}$.

SOLUTION. — $150 \div 12\frac{1}{2} = 150 \times 8 \div 100 = 12$.

23. Divide 200 by $16\frac{2}{3}$. 560 by 20. 250 by 25.

24. Divide 350 by $37\frac{1}{2}$. 600 by 50. 750 by $62\frac{1}{2}$.

25. Divide 900 by 75. 800 by $66\frac{2}{3}$. 3000 by $83\frac{1}{3}$.

26. Divide 300 by $33\frac{1}{3}$. 400 by $12\frac{1}{2}$. 4900 by $87\frac{1}{2}$.

27. Divide 600 by $37\frac{1}{2}$. 600 by $83\frac{1}{3}$. 6000 by $16\frac{2}{3}$.

GENERAL REVIEW

LESSON LIV

1. William had 23 cents, Thomas gave him 8 cents more, George 6 cents, James 5 cents, and David 7 cents; he paid 15 cents for a book. How many cents had he left?

2. A grocer paid \$12 for sugar, \$9 for coffee, \$5 for tea, \$7 for flour, and had \$10 left. How many dollars had he at first?

3. A boy has 11 cents. His father gives him 9 cents, his mother 6 cents, and his sister enough more to make 34 cents. How many cents does his sister give him?

4. Five men bought a horse for \$42. The first paid \$13; the second, \$7; the third, \$5; and the fourth, \$9. How many dollars did the fifth pay?

5. A man purchased 8 sheep, at \$4 a head; 5 barrels of flour, at \$3 a barrel; 4 yards of cloth, at \$3 a yard; and 5 chairs, at \$1 each. How much did he spend?

6. A boy lost 25 cents. After finding 15 cents, he had 25 cents. How many cents had he at first?

7. A man owed a debt of \$28, and paid all but \$9. How much did he pay?

8. I borrowed \$56. At one time I paid \$23; at another, all but \$7. How much did I pay the last time?

9. James borrowed 37 cents. At one time he paid 5 cents, at another 8 cents, and the third time, all but 15 cents. How many cents did he pay the third time?

10. A farmer sold 1 cow, at \$18, and 5 barrels of flour, at \$3 each, receiving in payment 3 sheep, at \$3 each, and the rest in money. How much money did he receive?

11. A farmer sold 12 barrels of apples at \$3 a barrel. He then purchased some salt for \$15, and some sugar for \$8. How many dollars had he left?

12. A merchant purchased 13 hats, at \$4 each; 5 pairs of shoes, at \$2 a pair; and an umbrella, for \$7. For how much must he sell the whole to gain \$9?

13. If 2 barrels of flour cost \$10, how much will 7 barrels cost? 5 barrels?

14. If 3 barrels of vinegar cost \$9, how much will 4 barrels cost? 9 barrels?

15. If 4 yards of cloth cost \$28, how much will 7 yards cost?

16. If 5 tons of hay cost \$45, how much will 8 tons cost?

17. If 7 apples cost 28 cents, how much will 3 apples cost?

18. If 8 oranges are worth 24 apples, how many apples are 3 oranges worth?

19. If 2 pounds of cheese cost 36 cents, how much will 3 pounds cost?

20. If 8 yards of cloth cost \$56, how much will 7 yards cost?

21. If 9 yards of calico cost 72 cents, how much will 6 yards cost? 8 yards? 10 yards?

22. A walks 5 miles, while B walks 3 miles. When A has gone 35 miles, how far has B gone?

23. George and his father are husking corn; the father can husk 7 rows while George husks 3. How many rows will George husk while his father husks 42?

24. Charles can earn \$9 while Mary earns \$4. How many dollars will Charles earn while Mary earns \$28?

25. If 6 horses eat 12 bushels of oats in a week, how many bushels will 10 horses eat in the same time?

26. If five horses eat 16 bushels in 2 weeks, how long would it take them to eat 56 bushels?

27. If 6 apples are worth 18 cents, how many apples must be given for 5 oranges, worth 6 cents each?

28. How many horses can eat in 9 days the same amount of hay that 12 horses eat in 6 days?

LESSON LV

1. If 4 yards of cloth cost \$16, how much will 5 yards cost? 9 yards?

2. What are $\frac{2}{3}$ of 72? $\frac{3}{4}$ of 72?

3. If you had 64 cents, how many oranges could you buy, at 8 cents each?

4. Ninety-six is how many times 6?

5. James had 48 chestnuts. He gave $\frac{1}{2}$ of them to his brother, and $\frac{1}{3}$ to his sister. How many had he left?

6. Nine times 9 are how many times 12?

7. In $8\frac{5}{9}$ how many ninths are there? In $9\frac{1}{3}$?

8. Reduce $\frac{48}{120}$, $\frac{54}{135}$, $\frac{240}{288}$, to their lowest terms.

9. Reduce $\frac{2}{3}$, $\frac{4}{18}$, $\frac{1}{12}$, to a least common denominator.

10. A farmer planted $4\frac{1}{2}$ acres in potatoes, $20\frac{3}{4}$ acres in wheat, and $24\frac{1}{8}$ acres in oats. How many acres did he plant?

11. From $9\frac{3}{8}$ take $5\frac{3}{8}$.

12. A man having 84 miles to travel, went $\frac{1}{4}$ of the distance the first day, $\frac{1}{3}$ the second, and the rest the third day. What part did he travel the last day, and how far?

13. What are 9 times $\frac{7}{18}$?

14. What are $\frac{7}{11}$ of 12?

15. If 4 yards of cloth cost \$15, how much will 7 yards cost?

16. How many are 7 times $7\frac{5}{7}$?
17. Four times $6\frac{3}{4}$ are how many times 7?
18. I bought $8\frac{3}{4}$ pounds of rice, at 8 cents a pound, and paid for it with nickels. How many nickels did it take?
19. What is $\frac{5}{8}$ of $\frac{3}{4}$ of $\frac{2}{3}$ of 6?
20. If 5 yards of ribbon cost $\$1\frac{3}{10}$, how much will 9 yards cost?
21. A farmer sold a horse for $\$99$, and gained $\frac{3}{8}$ of its cost. How much did it cost?
22. If $\frac{2}{5}$ of the cost of a horse was $\$96$, and it was paid for with the money received for flour, at $\$6$ a barrel, how many barrels were sold?
23. 84 is $\frac{7}{6}$ of how many times 9?
24. $\frac{9}{25}$ of 125 are how many times 5?
25. $\frac{3}{8}$ of 81 are $\frac{9}{8}$ of what number?
26. $\frac{4}{7}$ of 35 are $\frac{5}{6}$ of how many times $\frac{3}{8}$ of 16?
27. If a man pays $\$17\frac{1}{2}$ for $4\frac{3}{8}$ yards of cloth, what is the cost of 1 yard?
28. If an apple is worth $\frac{3}{4}$ of a cent, how many apples can be purchased for 18 cents?
29. $7\frac{2}{3}$ is $\frac{5}{7}$ of what number?
30. I bought $3\frac{1}{2}$ dozen hinges, at $\$1\frac{4}{5}$ a dozen. How much did they cost?
31. I bought 30 yards of percale, at $12\frac{1}{2}$ cents a yard. How many dollars did it cost?
32. I paid $\$7\frac{3}{4}$ for alpaca, at $33\frac{1}{3}$ cents a yard. How many yards did I buy?
33. How much a day must a man earn to receive $\$72$ for 8 weeks, 6 days to the week?
34. If a line $2\frac{2}{3}$ inches long is divided into 4 parts, how long is each part?
35. At 5 lemons for 3 cents, how many lemons can be bought for 12 cents?

36. If $1\frac{1}{4}$ yards of tapestry cost \$10, how much can be purchased for \$12?

37. Frank, who is 20 years old, is $\frac{2}{5}$ as old as his father. How old is his father?

38. By selling a quantity of cloth for \$21, I made $\frac{2}{5}$ of the cost. I paid for it with \$5 bills. How many did it take?

39. If $\frac{2}{3}$ of a certain distance is $\frac{2}{3}$ of a mile, how much is 3 times that distance?

40. What will be the cost of 11 yards of cloth, if $5\frac{1}{2}$ yards cost \$4 $\frac{2}{3}$?

41. $\frac{1}{3}$ of a certain number is 2 more than $\frac{1}{2}$ of 12. What is the number?

42. $\frac{1}{4}$ of a certain number is 3 less than $\frac{1}{5}$ of 30. What is the number?

43. $\frac{2}{5}$ of 20 are 6 less than how many thirds of 21?

44. $\frac{3}{4}$ of 24 are 6 more than $\frac{2}{3}$ of what number?

45. $\frac{5}{6}$ of 30, increased by 4, are 1 less than $\frac{3}{4}$ of some number. What is the number?

46. $\frac{2}{5}$ of 40 are 3 less than $\frac{2}{10}$ of how many times 6?

47. A boy having 40 cents gave $\frac{2}{5}$ of them for 2 melons. What was the price of 1 melon?

48. James had 14 cents, and gave $\frac{4}{7}$ of them to his sister. How many cents had he left?

49. John had 15 pears. He gave $\frac{1}{3}$ to Frank and $\frac{2}{5}$ to Harry. How many had he left?

50. A man had 30 yards of cloth, and sold $\frac{2}{5}$ of it for \$48. How much was that a yard?

51. John had 25 cents, and gave $\frac{4}{5}$ of them for peaches, at 2 cents each. How many did he buy?

52. A boy having 54 chestnuts, divided $\frac{5}{6}$ of them among 3 girls. How many did each receive?

53. A man had 28 barrels of flour, and sold $\frac{2}{7}$ of them for \$48. How much was that a barrel?

54. James had 48 cents. He gave $\frac{3}{8}$ to his brother, and spent the rest for chestnuts, at 9 cents a quart. How many quarts of chestnuts did he buy?

55. Thomas had 28 cents. He gave $\frac{1}{4}$ to his sister and $\frac{3}{7}$ to his brother, and with the remainder he bought 3 newspapers. How much did each cost?

56. If 5 men earn \$30 in 3 days, how much will 2 men earn in the same time? How much will 2 men earn in 1 day?

57. 6 is what part of $\frac{3}{5}$ of 40?

58. $\frac{3}{7}$ of 14 is what part of 54?

59. $\frac{5}{8}$ of 12 is what part of $\frac{4}{5}$ of 72?

60. $\frac{3}{5}$ of 20 is what part of twice that number of which 14 is $\frac{7}{9}$?

61. If $\frac{3}{8}$ of a ton of hay costs \$9, how much will $\frac{5}{8}$ of a ton cost?

62. If \$7 will buy 56 yards of muslin, how many yards will \$4 buy?

63. If 3 men can do a piece of work in 16 days, in how many days can 4 men do it?

64. If 3 men spend \$12 in one week, at the same rate how many dollars would 2 men spend in 6 weeks?

65. If 6 men do a piece of work in 7 days, in how many days can 3 men do it?

66. If 5 men do a piece of work in 8 days, in how many days can 4 men do a piece twice as large?

67. If 6 men perform a certain amount of labor in 5 days, in how many days can 2 men do $\frac{1}{2}$ that amount?

68. James had 16 apples. He kept $\frac{1}{4}$ of them himself and divided the remainder equally among 3 of his companions. How many did each receive?

69. Three fourths of 24, increased by $\frac{2}{3}$ of 12, are equal to how many?

70. Five sixths of 24, diminished by $\frac{3}{4}$ of 20, equal how many?

71. Two thirds of 12, less $\frac{1}{2}$ of 12, are $\frac{2}{5}$ of what number?

72. Add together $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{3}{4}$ of 12.

73. From 10 take $\frac{2}{5}$ of itself; add to the remainder its $\frac{1}{2}$. What is the result?

74. Of a certain flock of sheep $\frac{1}{3}$ are in one field, $\frac{1}{4}$ in another, and $\frac{1}{2}$ of the remainder in the third. If there are 28 sheep in the third field, how many are there in the flock?

75. If $\frac{5}{6}$ of a certain number is multiplied by 3, $\frac{2}{5}$ of the product is 90. What is the number?

76. After spending $\frac{2}{5}$ of my money and giving away $\frac{1}{3}$ of the remainder, I had 40 cents left. How much had I at first?

77. If 5 men do a piece of work in $4\frac{1}{2}$ days, how long will it take 6 men?

78. Frank's father earns \$16 a week, and Frank earns $\frac{3}{8}$ as much. How long will it take them to earn \$88 together?

79. Thomas had 28 cents. He gave $\frac{2}{7}$ of the amount to his sister, and $\frac{2}{5}$ of the remainder to his brother. How much more did he give away than he had left?

80. James had 35 marbles. He gave to Thomas $\frac{3}{7}$ of them, to Charles $\frac{2}{5}$. To which did he give more, and how many? What number had he left?

81. A man had \$28. He kept $\frac{2}{7}$ of the whole, and divided the remainder equally among his 4 brothers. How many dollars did each receive?

82. A grocer had 14 barrels of flour. He sold $\frac{4}{7}$ of it at \$3 a barrel, and the remainder at \$5 a barrel. What amount did he receive?

83. A merchant bought 15 yards of cloth, at \$2 a yard. He sold $\frac{1}{3}$ of it at \$4 a yard, $\frac{2}{3}$ at \$3 a yard, and the remainder at \$5 a yard. How much did he gain?

84. Mr. Blount bought 10 yards of cloth for \$90, and sold $\frac{2}{5}$ of it for \$40. How much a yard did he gain on the quantity sold?

85. Two men travel in the same direction. A is 40 miles ahead of B; but B travels 23 miles a day, and A 18. In how many days will B overtake A?

86. A hare is 90 feet in advance of a hound. The hound goes 10 feet in a second, and the hare 7 feet in a second. In how many seconds will the hound overtake the hare? How far will each run?

SOLUTION. — The hound gains $10 - 7 = 3$ feet a second on the hare. Therefore he will overtake the hare in $90 \div 3 = 30$ seconds. In 30 seconds the hound runs 10×30 feet = 300 feet, and the hare 7×30 feet = 210 feet.

87. If a hound runs 7 rods while a hare runs 4 rods, how far will the hare run while the hound runs 35 rods?

88. C and D travel in the same direction. C is 15 miles ahead of D; but D travels 5 miles an hour, and C only 2 miles. In how many hours will D overtake C? How far will D have traveled?

89. A cistern containing 24 gallons is filled by a pipe at the rate of 8 gallons an hour, and emptied by a pipe at the rate of 5 gallons an hour. If both pipes are open, how long will the cistern be in filling?

SOLUTION. — $8 - 5 = 3$ gallons fill up in one hour. Therefore it will take $24 \div 3 = 8$ hours to fill the cistern.

90. A cistern containing 36 gallons has 2 pipes. By the first it receives 6 gallons an hour, and by the second it discharges 9 gallons an hour. If both pipes are left open, how long will it take to empty the cistern?

91. A pair of trousers cost \$8, which was $\frac{2}{5}$ of the cost of a coat; a vest cost $\frac{1}{2}$ as much as the trousers. What was the cost of the whole suit?

92. A lady had \$1. She spent $\frac{2}{5}$ of the amount for oranges; $\frac{2}{3}$ of the remainder for lemons; and $\frac{1}{2}$ of the last remainder for an illustrated paper. How much had she left?

93. When hay was \$10 a ton, a farmer paid $\frac{2}{5}$ of a ton for 4 yards of cloth. How much was the cloth worth per yard?

94. A man can perform a journey in $3\frac{3}{8}$ days. What part of the journey can he perform in $2\frac{1}{4}$ days?

95. If a man can do a piece of work in $7\frac{1}{3}$ days, what part of the work can he do in $5\frac{1}{2}$ days?

96. I bought 20 yards of cloth at \$4 a yard, and 15 yards at \$3 a yard. I sold $\frac{6}{7}$ of the whole at \$3 a yard, and the remainder at \$4 a yard. What was the entire loss? What was the average loss per yard?

97. A man had \$96. He spent $\frac{1}{12}$ for books, $\frac{5}{11}$ of the remainder for clothing, $\frac{5}{6}$ of what then remained for furniture, and, with what was left, bought beans, at \$1 a bushel. How many bushels did he buy?

98. A and B are traveling in the same direction, A being 36 miles ahead of B; A travels $\frac{3}{4}$ of the distance per hour that B travels, and B travels 6 miles an hour. In how many hours will B overtake A?

TABLES AND MEASUREMENTS

LESSON LVI

UNITED STATES MONEY

10 mills, marked m., = 1 cent, marked ¢.

10 cents = 1 dime, marked d.

10 dimes or 100 cents = 1 dollar, marked \$.

1. How many mills are there in 2 cents?

SOLUTION. — In 1 cent there are 10 mills; hence, in 2 cents there are 2 times 10 mills = 20 mills.

2. How many mills are there in 3 cents? In 4 cents? 5 cents? 6 cents? 7 cents? 8 cents? 9 cents?

3. How many cents are there in 2 dimes? In 3 dimes? 4 dimes? 5 dimes? 9 dimes?

4. How many dimes are there in 2 dollars? In 3 dollars? 4 dollars? 5 dollars? 7 dollars? 9 dollars?

5. How many dimes are there in $\frac{1}{2}$ a dollar? In $1\frac{1}{2}$ dollars? In $5\frac{1}{2}$ dollars? In $6\frac{1}{2}$ dollars?

6. How many cents are there in 2 dollars?

SOLUTION. — In 1 dollar there are 100 cents; hence, in 2 dollars there are 2 times 100 cents = 200 cents. Or, in 1 dollar there are 10 dimes; hence, in 2 dollars there 2 times 10 dimes = 20 dimes. In 1 dime there are 10 cents; hence, in twenty dimes there are 20 times 10 cents = 200 cents.

7. How many cents are there in 3 dollars? In 4 dollars? 5 dollars? 6 dollars? 7 dollars? 8 dollars? 9 dollars?

8. How many cents are there in $\frac{1}{2}$ of a dollar? In $\frac{1}{4}$ of a dollar? In $\frac{1}{5}$ of a dollar? In $\frac{1}{8}$ of a dollar? In $\frac{3}{8}$ of a dollar? In $\frac{7}{8}$ of a dollar?

9. How many cents are there in $2\frac{1}{2}$ dollars? In $3\frac{1}{4}$ dollars? In $7\frac{3}{4}$ dollars? In $6\frac{5}{8}$ dollars? In $5\frac{7}{8}$ dollars?

10. Twenty cents are how many dimes?

SOLUTION. — 10 cents are 1 dime; hence, 20 cents are as many dimes as 10 is contained times in 20, which are 2.

11. Thirty cents are how many dimes? 40 cents? 50 cents? 60 cents? 70 cents? 90 cents?

12. Twenty dimes are how many dollars? 30 dimes? 40 dimes? 60 dimes? 80 dimes?

13. Two hundred cents are how many dollars?

SOLUTION. — 100 cents = \$1; hence, 200 cents are as many dollars as 100 is contained times in 200, which are 2. Or, 10 cents = 1 dime; hence, 200 cents = as many dimes as 10 is contained times in 200, which are 20. 10 dimes = 1 dollar; hence, 20 dimes = as many dollars as 10 is contained times in 20, which are 2.

14. Three hundred cents are how many dollars? 400 cents? 500 cents? 700 cents?

LESSON LVII

DRY MEASURE

2 pints (pt.) = 1 quart, marked qt.

8 quarts = 1 peck, marked pk.

4 pecks = 1 bushel, marked bu.

1. How many pints are there in 2 quarts? In 3 quarts? 4 quarts? 5 quarts? 6 quarts?

2. How many pints are there in $\frac{1}{2}$ a quart? In $\frac{1}{4}$ of a quart? $\frac{1}{8}$ of a quart? In $2\frac{1}{2}$ quarts? In $3\frac{3}{4}$ quarts? In $5\frac{1}{8}$ quarts?

3. How many quarts are there in 2 pecks? In 3 pecks?

4. How many quarts are there in $\frac{1}{2}$ a peck? In $\frac{1}{4}$ of a peck? In $\frac{3}{4}$ of a peck? In $\frac{1}{8}$ of a peck? In $\frac{3}{8}$ of a peck? In $3\frac{1}{2}$ pecks? In $2\frac{1}{4}$ pecks? In $4\frac{3}{8}$ pecks? In $6\frac{7}{8}$ pecks?

5. How many pecks are there in 2 bushels? In 3 bushels? 4 bushels? 6 bushels? 12 bushels?

6. How many pecks are there in $\frac{1}{2}$ a bushel? In $\frac{1}{4}$ of a bushel? In $\frac{3}{4}$ of a bushel? In $2\frac{1}{2}$ bushels? In $3\frac{3}{4}$ bushels? In $6\frac{1}{4}$ bushels?

7. Four pints are how many quarts? 6 pints? 8 pints? 10 pints? 12 pints? 14 pints? $8\frac{1}{2}$ pints?

8. Sixteen quarts are how many pecks? 24 quarts? $16\frac{1}{2}$ quarts? $24\frac{1}{4}$ quarts?

9. Eight pecks are how many bushels? 12 pecks? 20 pecks? 28 pecks? $12\frac{1}{2}$ pecks? $16\frac{1}{4}$ pecks?

10. What part of a quart is 1 pint?

11. What part of a peck are 2 quarts? 3 quarts? 4 quarts? 7 quarts?

SOLUTION.—In one peck there are 8 quarts; hence, 2 quarts are $\frac{1}{4} = \frac{1}{4}$ of a peck.

12. What part of a bushel are 4 quarts? 2 pecks? 3 pecks? 4 pecks?

13. Reduce 3 qt. 1 pt. to pints.

SOLUTION.—In 1 qt. there are 2 pt.; hence, in 3 qt. there are 3 times 2 pt. = 6 pt.; 6 pt. + 1 pt. = 7 pt.

14. Reduce 3 pk. 5 qt. to quarts.

15. Reduce 3 bu. 2 pk. to pecks.

16. Reduce 2 pk. 3 qt. 1 pt. to pints.

17. Reduce 2 bu. 3 pk. 7 qt. to quarts.

18. Reduce 1 bu. 2 pk. 2 qt. 1 pt. to pints.

19. Reduce 7 pt. to quarts.

SOLUTION.—2 pt. are 1 qt.; hence, 7 pints are as many quarts as 2 is contained times in 7 which are three and 1 rem. = 3 qt. 1 pt.

20. Reduce 9 pt. to quarts. 11 pt. 13 pt. 15 pt.

21. Reduce 10 qt. to pecks. 11 qt. 13 qt. 23 qt.

22. Reduce 7 pk. to bushels. 10 pk. 15 pk. 17 pk.

23. Reduce 27 pt. to pecks.

SOLUTION. — 27 pt. \div 13 qt. 1 pt.; 13 qt. = 1 pk. 5 qt. Therefore, 27 pt. = 1 pk. 5 qt. 1 pt.

24. Reduce 35 pt. to pecks. 39 pt. 43 pt. 45 pt.

25. Reduce 53 qt. to bushels. 55 qt. 57 qt. 59 qt.

26. Reduce 83 qt. to bushels. 86 qt. 89 qt. 92 qt.

27. Reduce 223 pt. to bushels. 224 pt. 226 pt. 228 pt.

28. Reduce 345 pt. to bushels. 346 pt. 347 pt. 348 pt.

29. Reduce 6 bu. 2 qt. to quarts.

30. Reduce 2 bu. 1 pt. to pints.

31. Reduce 4 bu. 2 pk. to pints.

32. Reduce 3 bu. 7 qt. 1 pt. to pints.

33. Reduce 5 bu. 3 pk. 1 pt. to pints.

34. Reduce 7 bu. 3 pk. 7 qt. to pints.

LESSON LVIII

LIQUID MEASURE

4 gills (gi.) = 1 pint, marked pt.

2 pints = 1 quart, marked qt.

4 quarts = 1 gallon, marked gal.

1. How many pints are there in 2 qt.? In 3 qt.? In $\frac{1}{2}$ of a quart? In $\frac{1}{4}$ of a quart? In $\frac{3}{4}$ of a quart?

2. How many quarts are there in 2 gal.? In 3 gal.? 4 gal.? 6 gal.? 8 gal.? 10 gal.? 12 gal.? In $12\frac{1}{2}$ gal.? In $6\frac{1}{4}$ gal.? In $6\frac{3}{4}$ gal.?

3. 5 gi. are how many pints? 6 gi.? 7 gi.?

4. 3 pt. are how many quarts? 4 pt.? 5 pt.? 6 pt.? 7 pt.? $2\frac{1}{2}$ pints?

5. 5 qt. are how many gallons? 6 qt.? 7 qt.? 8 qt.? 9 qt.? 10 qt.? 11 qt.? 12 qt.? $4\frac{1}{2}$ qt.?

6. How many gills are there in 1 qt.? In 2 qt.? 3 qt.?

7. How many pints are there in 1 gal.? In 2 gal.? 3 gal.? 4 gal.? 5 gal.? In $2\frac{1}{2}$ gal.? In $3\frac{1}{4}$ gal.? In $2\frac{3}{4}$ gal.? In $2\frac{1}{8}$ gal.?

8. How many gills are there in 1 gal.? In 2 gal.? 3 gal.? 4 gal.? 5 gal.?

9. What part of a gallon are 3 quarts?

SOLUTION.—In 1 gallon there are 4 quarts; hence 3 quarts are $\frac{3}{4}$ of a gallon.

10. What part of a pint are 2 gills? 3 gills?

11. What part of a quart is 1 pint?

12. Reduce 1 pt. 3 gi. to gills.

13. Reduce 6 pt. 2 gi. to gills.

14. Reduce 3 qt. 1 pt. to pints.

15. Reduce $5\frac{1}{2}$ qt. to pints.

16. Reduce 5 gal. 2 qt. to quarts.

17. Reduce $8\frac{3}{4}$ gal. to quarts.

18. Reduce 2 qt. 1 pt. 1 gi. to gills.

19. Reduce 8 qt. 3 gi. to gills.

20. Reduce 4 gal. 3 qt. 1 pt. to pints.

21. Reduce 3 gal. 5 pt. to pints.

22. Reduce 1 gal. 1 qt. 1 pt. 3 gi. to gills.

23. Reduce 23 pt. to gallons.

24. Reduce 18 pt. to quarts.

25. Reduce 16 qt. to gallons.

26. Reduce 64 qt. to gallons.

27. Reduce 64 pt. to gallons.

28. Reduce 72 pt. to gallons.

29. Reduce 6 gal. 2 pt. to gills.

30. Reduce 8 gal. 3 gi. to gills.

31. Reduce 10 gal. 10 qt. 10 pt. to gills.

32. Reduce 5 gal. 4 gi. to pints.

33. Reduce 9 gal. 16 gi. to pints.

LESSON LIX

AVOIRDUPOIS WEIGHT

16 ounces (oz.)	= 1 pound,	marked lb.
100 pounds	= 1 hundredweight,	marked cwt.
20 hundredweights	= 1 ton,	marked T.
2000 pounds	= 1 ton.	

1. How many ounces are there in 2 lb.? In 3 lb.? 1 lb.? 5 lb.? 6 lb.? 10 lb.? In $\frac{1}{2}$ lb.? In $\frac{1}{4}$ lb.? In $\frac{3}{4}$ lb.? In $\frac{1}{8}$ lb.? In $1\frac{1}{2}$ lb.? In $2\frac{1}{4}$ lb.? In $3\frac{3}{4}$ lb.?

2. How many pounds are there in 2 cwt.? In 3 cwt.? 4 cwt.? 5 cwt.? 6 cwt.? 7 cwt.? 8 cwt.? 9 cwt.? In $\frac{1}{2}$ cwt.? In $\frac{1}{4}$ cwt.? In $1\frac{1}{2}$ cwt.? In $3\frac{3}{4}$ cwt.?

3. How many hundredweights are there in 2 tons? In 3 tons? 4 tons? 5 tons? 6 tons? In $\frac{1}{2}$ ton? In $\frac{1}{4}$ ton? In $2\frac{1}{2}$ tons? In $3\frac{3}{4}$ tons?

4. Forty-two oz. are how many pounds? 53 oz.? 75 oz.? 90 oz.?

5. Three hundred lb. are how many hundredweights? 450 lb.? 575 lb.? 1200 lb.?

6. Forty cwt. are how many tons? 50 cwt.? 75 cwt.? 80 cwt.? 96 cwt.?

7. Reduce 10 lb. 10 oz. to ounces.

8. Reduce 15 cwt. 45 lb. to pounds.

9. Reduce 4 T. 10 cwt. 75 lb. to pounds.

10. Twelve ounces are what part of a pound?

SOLUTION. — In 1 lb. there are 16 oz.; hence, 12 oz. are $\frac{12}{16} = \frac{3}{4}$ lb.

11. Eight oz. are what part of a pound? 10 oz.? 14 oz.?

12. Ten lb. are what part of a hundredweight? 20 lb.? 25 lb.? 40 lb.? 50 lb.? 60 lb.? 75 lb.? 80 lb.?

13. Four cwt. are what part of a ton? 5 cwt.? 6 cwt.? 10 cwt.? 12 cwt.? 15 cwt.? 16 cwt.? 18 cwt.?

LESSON LX

LONG MEASURE

12 inches (in.)	= 1 foot,	marked ft.
3 feet	= 1 yard,	marked yd.
$5\frac{1}{2}$ yards	= 1 rod,	marked rd.
40 rods	= 1 furlong,	marked fur.
8 furlongs	= 1 mile,	marked mi.

1. How many inches are there in 2 ft.? In $\frac{1}{2}$ ft.? In $\frac{1}{3}$ ft.? In $\frac{1}{4}$ ft.? In $2\frac{1}{2}$ ft.? In $3\frac{1}{4}$ ft.?

2. How many feet are there in 2 yd.? In 3 yd.? 4 yd.? 5 yd.? In $6\frac{1}{2}$ yd.? In $5\frac{3}{4}$ yd.?

3. How many yards are there in 2 rd.? In 4 rd.? 5 rd.? 7 rd.? 10 rd.?

4. How many rods are there in 3 fur.? In 4 fur.? 5 fur.? In $\frac{1}{2}$ fur.? In $\frac{1}{4}$ fur.?

5. How many furlongs are there in 9 miles?

6. How many furlongs are there in $\frac{1}{4}$ mile? $\frac{1}{2}$ mile? $\frac{1}{8}$ mile?

7. Thirty-six inches are how many feet? 48 in.? 60 in.? 72 in.?

8. Fifteen feet are how many yards? 21 ft.? 36 ft.? 24 ft.? 18 ft.?

9. Twenty-two yards are how many rods? 33 yd.?

10. Six hundred and forty rd. are how many miles?

11. Sixteen rd. are what part of a mile?

SOLUTION.—In one mi. there are 8 fur.; in 8 fur. there are 320 rd.; 16 rd. are $\frac{1}{20}$ of a mile.

12. Twenty-four rods are what part of a mile?

13. Three yd. are what part of a rod?

14. Two feet are what part of a yard? Of a rod?

15. Six inches are what part of a foot? Of a yard? Of a rod?

LESSON LXI

TIME TABLE

60 seconds (sec.)	=1 minute,	marked min.
60 minutes	=1 hour,	marked hr.
24 hours	=1 day,	marked da.
365 days	=1 common year,	marked c. yr.
366 days	=1 leap year,	marked l. yr.
100 years	=1 century,	marked cen.
7 days	=1 week,	marked wk.
4 weeks	=1 month,	marked mo.
12 calendar months	=1 year,	marked yr.

One solar year contains 365 days, 5 hours, 48 minutes, and 46 seconds, or $365\frac{1}{4}$ days, *nearly*.

The following table shows the names of the different months of the year, and the number of days embraced in each:

January, 1st mo.,	31 da.	July,	7th mo., 31 da.
February, 2d mo.,	28 or 29 da.	August,	8th mo., 31 da.
March, 3d mo.,	31 da.	September,	9th mo., 30 da.
April, 4th mo.,	30 da.	October,	10th mo., 31 da.
May, 5th mo.,	31 da.	November,	11th mo., 30 da.
June, 6th mo.,	30 da.	December,	12th mo., 31 da.

The names of the months which have 30 days each may be remembered by the following couplet:

Thirty days have September,
April, June, and November.

1. What is the value of $\frac{1}{2}$ min.? $\frac{1}{3}$ min.? $\frac{3}{4}$ min.?
2. What is the value of $\frac{1}{5}$ hr.? $\frac{2}{5}$ hr.? $\frac{3}{5}$ hr.? $\frac{5}{6}$ hr.?
3. What is the value of $\frac{1}{2}$ da.? $\frac{2}{3}$ da.? $\frac{5}{6}$ da.? $\frac{3}{8}$ da.?
4. What is the value of $\frac{3}{4}$ wk.? $\frac{5}{7}$ wk.? $4\frac{2}{7}$ wk.?
5. What is the value of $\frac{1}{2}$ mo.? $\frac{3}{4}$ mo.? 3 mo.? $2\frac{1}{3}$ mo.?
6. Twenty sec. are what part of a minute?
7. Fifty min. are what part of an hour?
8. Twelve hr. are what part of a day? Of a week?
9. Five days are what part of a week?

10. Eight calendar months are what part of a year?
11. Three hr. 30 min. are what part of a day?
12. Three da. 12 hr. are what part of a week?
13. One wk. 3 da. are what part of a month?
14. One wk. 3 da. 16 hr. are what part of a month?
15. How many days are there in April and May taken together?
16. How many days are there in June, July, and August taken together?
17. How many days are there in September, October, and November taken together?
18. How many days are there from July 12 to July 28?
19. How many days are there from October 27 to December 25?
20. How many days are there from the Vernal Equinox, March 20, to the Autumnal Equinox, September 22?
21. How many days are there from the Summer Solstice, June 21, to the Winter Solstice, December 21?

LESSON LXII

The number of square units that a surface contains is called its **area**. If a sheet of paper is 4 inches long and 3 inches wide, its surface contains $4 \times 3 = 12$ square inches. The area of the paper is 12 square inches.

The square units are square inches, square feet, square yards, square rods, acres, square miles.

A figure that has four straight sides and four equal angles is a **rectangle**. If the four sides are equal and the four angles are equal, it is a **square**.

The area of a rectangle is found by multiplying the number of units in length by the number of like units in width. The product will be the number of square units in area.

1. What is the area of a rectangle that is 5 feet long and 3 feet wide?

SOLUTION. — $5 \times 3 = 15$; 15 square feet.

2. How many square feet are there in a grass plot 6 feet long and 4 feet wide?

3. How many square feet are there in a room 10 feet long and 12 feet wide?

4. How many square inches are there in a sheet of paper 6 inches long and 8 inches wide?

5. How many square feet are there in a flower bed 10 feet square? (This means 10 feet long and 10 feet wide.)

6. What is the area of a room 12 feet square?

7. What is the area of a ceiling 12 feet long and 8 feet wide?

8. How many square miles are there in a park 3 miles long and 2 miles wide?

9. How many square inches are there in a sheet of paper 11 inches square?

10. How many square yards are there in a roll of wall paper 8 yards long and $\frac{1}{2}$ yard wide?

11. How many square yards are there in a double roll of wall paper 16 yards long and $\frac{1}{2}$ yard wide?

12. How many yards of carpet 1 yard wide will it take to carpet a room 90 feet square?

SOLUTION. — The carpet is 3 feet wide. Therefore it will take $90 \div 3 = 30$ strips each 90 ft. or 30 yd. long. 30×30 yd. = 900 yards.

13. How many yards of carpet 1 yard wide will it take to carpet a hall 9 feet wide and 100 feet long?

14. At \$1 a yard, how much will it cost to carpet a room 12 ft. wide and 30 ft. long with carpet 1 yard wide?

15. How many yards of carpet 1 yard wide will be required to carpet a room 15 feet square?

16. How many square inches are there in the top of a desk 30 inches long and 20 inches wide?

17. How many square feet are there in the floor of a hall 42 feet long and 10 feet wide?

18. How much plastering will it take to cover a ceiling 20 feet long and 16 feet wide?

19. How much plastering will it take to cover the ceiling of a room 30 feet long, 16 feet wide, and 10 feet high?

20. How much plastering will it take to cover the four walls of the room described in Ex. 19? The four walls and the ceiling?

21. How much plastering will it take to cover the walls and ceiling of a room 20 feet long, 10 feet wide, and 10 feet high?

Lumber is sold by the board foot. A **board foot** is 1 foot long, 1 foot wide, and 1 inch thick. The number of board feet in a piece of lumber is ascertained by finding the surface of the board in square feet and multiplying this by the number representing the thickness of the board in inches.

22. How many board feet are there in a board 10 feet long, 2 feet wide, and 3 inches thick?

SOLUTION. — $10 \times 2 = 20$ square feet in surface; $20 \times 3 = 60$ board feet.

23. How many board feet are there in a board 18 feet long, 2 feet wide, and 1 inch thick?

24. How many board feet are there in a board $12\frac{1}{2}$ feet long, 2 feet wide, and 2 inches thick?

25. How many board feet are there in a plank 15 feet long, 3 feet wide, and 3 inches thick?

26. How many board feet are there in a 2-inch board 14 feet long and 2 feet wide?

27. How many board feet are there in a 3-inch plank 12 feet long, and 4 feet wide?

28. How many board feet are there in a piece of scantling 12 feet long, $\frac{1}{3}$ foot wide, and 3 inches thick?

29. How many board feet are there in a 1-inch board 16 feet long, and $1\frac{1}{4}$ feet wide?

Cubic measure is used to find the solid contents of bodies having length, breadth, and thickness or height. The units are cubic inches, cubic feet, cubic yards, and cords.

A **cube** is a solid having six equal faces which are squares.

The solid contents of a cube or a rectangular solid is found by multiplying together the numbers representing the length, breadth, and thickness.

Thus the contents of a rectangular box 2 feet long, 3 feet wide, and 4 feet thick is $2 \times 3 \times 4 = 24$ cubic feet.

30. How many cubic feet are there in a block of marble 3 feet long, 2 feet wide, and 1 foot thick?

31. How many cubic inches are there in a box 3 inches long, 1 inch wide, and 2 inches high?

32. What is the contents of a cubical box 3 feet on each side?

33. How many 2-foot cubical boxes can be put inside a 4-foot cubical case?

34. How many cubic feet of air are there in a room 20 feet long, 10 feet wide, and 10 feet high?

35. A cord of wood is a pile 8 feet long, 4 feet wide, and 4 feet high. How many cubic feet does a cord contain?

36. At \$4 a cord how much will a pile of wood cost that is 16 feet long, 4 feet wide, and 4 feet high?

37. How many cubic feet of earth must be removed in digging a cellar that is 40 feet long, 20 feet wide, and 5 feet deep?

GENERAL REVIEW

LESSON LXIII

1. What is the cost of 5 bu. 3 pk. of corn, at 60 cents a bushel?

2. When milk is 5 cents a pint, how much does a milkman get for 4 gal. 2 qt. 1 pt.?

3. At 10 cents a pound, what will be the cost of 7 lb. 12 oz. of lemon sugar?

4. How much will it cost to build a fence 5 rd. 2 yd. 2 ft. 3 in. long, at \$12 a rod?

5. A steamer from Milwaukee to Grand Haven, at the average rate of 9 miles an hour, was 9 hr. 26 min. 40 sec in making the trip. What is the distance?

6. How much velvet, at \$8 a yard, can be purchased for \$23?

7. How much coffee, at 30¢ per lb., can be bought for \$5?

8. Add $\frac{3}{10}$ da. and $\frac{2}{3}$ hr.

9. Add $\frac{1}{3}$ rd., $\frac{1}{2}$ yd., and $\frac{3}{4}$ ft.

10. When a bushel measure is half full of apples, how many more pecks will it hold?

11. If 1 bu. 3 pk. of oats are worth 70¢, how much are 2 bu. 1 pk. 4 qt. worth?

12. If a wagon wheel goes 3 yd. 1 ft. in making 1 revolution, how far will it go in making 7 revolutions?

13. If $\frac{2}{3}$ T. of hay cost \$8, how much will 3 cwt. 75 lb. cost?

14. The time by rail from Cincinnati to Dayton, a distance of 60 miles, is 2 hr. 24 min.; what is the rate of travel per hour of the train?

15. If a cart wheel makes 1 revolution in going 3 yd. 1 ft. 6 in., how many revolutions will it make in going 1 rd. 5 yd.?

16. How many weeks are there in April, May, and June taken together?

17. I bought some roasted Java coffee for \$2 and 35¢, paying 40¢ a lb. How many pounds did I buy?

NOTE.—\$2 and 35¢ is usually written \$2.35.

18. If there are 3 gal. in a dozen bottles of vinegar, how much will 3 dozen bottles cost, at 20¢ a quart?

19. If 2 bu. 3 pk. of corn cost \$1.65, how much is that a bushel?

20. If there are 25 bu. in a ton of coal, how much will 150 bu. cost, at \$5.75 a ton? How much a bushel?

21. A lot is 50 ft. wide and 100 ft. long. How much will it cost to put a fence around it, at \$5 a rod?

22. At 2 for 3 cents, how much will a dozen cakes cost?

23. If there are 8 yards of wall paper in a roll, how many yards are there in $1\frac{1}{2}$ rolls?

LESSON LXIV

1. A merchant bought at one time 33 gallons of oil; at another, 20 gallons; at another, 50 gallons; and at another, 62 gallons. How many gallons did he buy in all?

2. A lady paid \$23 for a dress, \$18 for a jacket, and \$9 for a bonnet. How much did she pay for all?

3. I owe A \$50, B \$75, C \$40, and D \$20. How much money do I owe all together?

4. Having \$92, I purchased a watch for \$73. How much money had I left?

5. A man bought a horse for \$110, and sold him for \$145. How much did he make?

6. George bought candles for 25¢, soap for 10¢, sugar for 35¢, and starch for 3¢. He gave the grocer \$1, and received 30¢ change. How much was this incorrect?

7. A boy had \$5, from which he took at one time \$1.50; at another, 40¢; at another, \$1.10. How much money had he left?

8. What will be the cost of 5 yd. of cloth, at \$2.50 a yard?

9. A man traveling at the rate of 5 miles an hour meets a stage going at the rate of 9 miles an hour. How far apart will they be in 10 hours?

10. I bought 15 lb. of dates, at 11¢ a pound, and 13 lb., at 9¢ a pound. How much did the whole cost?

11. Henry has 19¢, George 3 times as many, lacking 10¢. How many have both?

12. How many yards are there in 3 bales of cloth, each containing 5 pieces of 40 yd. each?

13. If a boat sails 48 miles in 12 hours, how far will it sail in 7 hours?

14. If a car runs a mile in 2 minutes, how far will it run in 1 hour?

15. If it is quarter past 5 o'clock, in how many minutes will it be 6 o'clock?

16. At 15¢ a pound, how many pounds of meat can be purchased for \$6?

17. Three men bought a horse for \$90. They kept him 6 weeks, at \$3 a week, and made \$42 from his use. They then sold him for \$99. How much did each man make?

18. A farmer sold 12 bu. of corn, at 45¢ a bushel, and 8 bu. of wheat, at 95¢ a bushel. He then bought 7 yd. of

cloth, at 80¢ a yard, and spent the balance for coffee, at 33 $\frac{1}{3}$ ¢ a pound. How much coffee did he buy?

19. If I buy 9 bbl. of flour, at \$6.50 a barrel, and 12 lb. of dates, at 12 $\frac{1}{2}$ ¢ a pound, how many apples, at 60¢ a bushel, shall I have to sell to pay for them?

LESSON LXV

1. If $\frac{1}{4}$ of a yard of cloth costs \$2, how much will $\frac{1}{8}$ of a yard cost?

2. If $\frac{2}{3}$ of a line is 5 inches, how long is $\frac{3}{4}$ of the line?

SOLUTION.— $\frac{1}{3}$ of the line is $\frac{1}{2}$ of 5 inches = $\frac{5}{2}$ inches; and the whole line is 3 times $\frac{5}{2}$ inches, or $\frac{15}{2}$ inches. Hence $\frac{3}{4}$ of the line will be $\frac{3}{4}$ of $\frac{15}{2}$ inches, or $\frac{45}{8}$ = 5 $\frac{5}{8}$ inches.

3. If $\frac{2}{5}$ of the distance to school is 3 miles, what is $\frac{3}{5}$ of the distance?

4. If $\frac{4}{7}$ the length of a pole is 24 feet, what is $\frac{5}{14}$ of the length?

5. If $\frac{5}{9}$ the circumference of a circle is 15 inches, what is $\frac{1}{2}$ the circumference?

6. If $\frac{3}{8}$ of an orchard contains 30 fruit trees, how many trees are there in $\frac{7}{8}$ of it?

7. If 1 $\frac{2}{3}$ yd. of cloth cost \$14, how much will 2 $\frac{1}{2}$ yd. cost?

8. If 1 $\frac{1}{2}$ bbl. of flour cost \$5 $\frac{1}{4}$, how much will 2 $\frac{1}{2}$ bbl. cost?

9. If 3 $\frac{1}{4}$ lb. of cheese cost 65¢, how much will 2 $\frac{3}{4}$ lb. cost?

10. A traveled 30 mi. in 3 $\frac{3}{4}$ hr. At that rate, how far could he travel in 7 $\frac{1}{4}$ hr.?

11. If a man earns \$1 $\frac{1}{4}$ in 10 hr., how much can he earn in 11 hr.?

12. A can earn \$9 $\frac{3}{8}$ in 6 da., of 8 hr. each. How much can he earn in 7 da., of 9 hr. each?

13. If 5 $\frac{1}{4}$ bu. of beans cost \$9 $\frac{1}{5}$, how much will 3 $\frac{1}{2}$ bu. cost?

14. If 8 $\frac{1}{3}$ is $\frac{4}{7}$ of a number, what is $\frac{4}{5}$ of it?

15. If $3\frac{1}{2}$ is $2\frac{1}{3}$ times some number, what is $2\frac{1}{2}$ times that number?

16. If $\frac{3}{4}$ of a barrel of flour cost $\$4\frac{1}{2}$, how much will $\frac{3}{8}$ of a barrel cost?

17. If $\frac{3}{8}$ of the distance between two desks is $\frac{3}{8}$ of a yard, what is $\frac{5}{8}$ of the distance?

18. Two thirds of $1\frac{1}{5}$ are $\frac{2}{7}$ of what number?

19. Five ninths of $5\frac{2}{3}$ are $\frac{8}{9}$ of what number?

20. Four sevenths of $4\frac{3}{8}$ are $\frac{5}{11}$ of what number?

21. Five sevenths of $5\frac{4}{5}$ are $\frac{7}{10}$ of what number?

22. Two thirds of $2\frac{2}{3}$ are $\frac{1}{2}$ of how many times 2?

23. Three fifths of $1\frac{1}{5}$ are $\frac{2}{7}$ of how many times 4?

24. Three fourths of $3\frac{1}{5}$ are $\frac{3}{8}$ of how many times 3?

25. John has 10 marbles, and $\frac{4}{5}$ of the number John has are $\frac{8}{11}$ of the number James has. How many has James?

26. Jean received $\frac{3}{5}$ of 60 plums; she gave away $\frac{4}{9}$ of $\frac{3}{4}$ of them. How many were left?

27. Frank has a given distance to travel. After going 35 mi., there remain $\frac{2}{3}$ of the distance. When he has gone $\frac{3}{4}$ of the remainder, how far must he still go?

28. A horse cost \$40; $\frac{3}{4}$ of the price of the horse was $\frac{5}{6}$ of the price of a cart. How much did the cart cost?

29. B's coat cost \$27, and his hat \$8; $\frac{4}{5}$ of the cost of the coat plus $\frac{3}{4}$ that of the hat equaled $\frac{2}{3}$ of the cost of his watch. How much did the watch cost?

30. Mary lost $\frac{2}{7}$ of her plums; she gave $\frac{3}{8}$ of the remainder to Sarah, and had 6 plums left. How many had she at first?

31. John has 12 cents; $\frac{3}{8}$ of his money equals $\frac{1}{2}$ of $\frac{4}{5}$ of William's money. How much has William?

32. On counting their money, it was found that A had 12 cents more than B; and that $\frac{1}{2}$ of B's money equaled $\frac{2}{7}$ of A's. How much had each?

33. In an orchard, $\frac{1}{8}$ of the trees are apple trees, $\frac{1}{4}$ are pear trees, $\frac{1}{12}$ are plum trees, and the remainder, which is 32, are cherry trees. How many trees are there of each kind?

34. In an orchard of apple and pear trees, the latter are $\frac{2}{9}$ of the whole; the apple trees are 25 more than the pear trees. How many are there of each?

LESSON LXVI

1. What number added to itself will give a sum equal to 14?

SOLUTION. — A number added to itself is twice the number; hence, twice the number is 14; and the number is $\frac{1}{2}$ of 14 = 7.

2. What number added to itself 3 times will make 32?

3. Divide 16 in two parts, so that the second part shall be 3 times the first.

SOLUTION. — If the second part is 3 times the first, the two parts together are $3 + 1 = 4$ times the first. Then the first is $\frac{1}{4}$ the whole and the second $\frac{3}{4}$. $\frac{1}{4}$ of 16 = 4; $\frac{3}{4}$ of 16 = 12.

4. Divide 48 into two such parts that the second shall be 7 times the first.

5. Divide 24 into three parts, so that the second shall be 2 times and the third 3 times the first.

6. Divide 45 into three parts, so that the second shall be three times and the third 5 times the first.

7. When 10 was taken from a number, $\frac{2}{3}$ of it remained. What was that number?

8. The sum of two numbers is 25; if 10 is the less number, what is their difference?

9. The sum of two numbers is 12; if 6 is added to the sum, the result will be twice the greater number. What are the numbers?

10. If 6 is taken from the difference of two numbers, the remainder will be 2. If 4 is one of the numbers, what is the other?

11. If 10 is added to the difference between two numbers, the sum will be 6 more than the greater number, which is 19. What is the less number?

12. If 10 is taken from the sum of two numbers, 8 will be left. If 5 is one of the numbers, what is the other?

13. The sum of two numbers is 16, and their difference is 4. What are the numbers?

SOLUTION. — Since the difference equals the greater *minus* the less, and the sum equals the greater *plus* the less, by adding the sum and the difference we get twice the greater, minus the less plus the less, which equals twice the greater. $16 + 4 = 20$, twice the greater number; then, the greater number is $\frac{1}{2}$ of $20 = 10$, and the less number is $10 - 4 = 6$.

14. The sum of two numbers is 25, and their difference is 5. What are the numbers?

15. The sum of two numbers is 31, and the greater exceeds the less by 7. What are the numbers?

16. Divide 15 cents between A and B, so that B may have 3 cents more than A.

17. Thomas has 5 apples more than James, and both together have 19 apples. How many has each?

18. Edward and Dick each had the same number of cents, but Edward earned 8 cents more. They then had together 32 cents. How many had each?

19. Frank and William each bought the same number of peaches. After Frank ate 4, and William 6, they both together had 20 left. How many peaches had each remaining?

20. Mary bought twice as many cherries as Ruth; and, after Mary had eaten 7, and Ruth 5, they had only 24 left. How many had each left?

21. If 5 is added to three times a certain number, the sum will be 50. What is the number?

22. If $\frac{3}{4}$ of a certain number is increased by 10, the sum will be 31. What is the number?

23. If $\frac{4}{5}$ of a number is diminished by 7, the remainder will be 21. What is the number?

LESSON LXVII

1. Divide 15 into two parts, so that the less part may be $\frac{2}{3}$ of the greater.

SOLUTION.—The two parts together are $\frac{1}{3} + \frac{2}{3} = \frac{3}{3}$ of the greater; $\frac{1}{3}$ of the greater part = 15. Hence, $\frac{2}{3}$ of the greater part is $\frac{2}{3}$ of 15 = 10, and the greater part is 3 times 3 = 9; the less part is 15 - 9 = 6.

2. Thomas and John have \$60 to pay; John has $\frac{3}{4}$ as much to pay as Thomas. How much must each pay?

3. I had 56 mi. to travel in 2 da. The second day I went $\frac{3}{4}$ as far as the first. How far did I travel each day?

4. Divide 100 into two such parts, that $\frac{5}{7}$ of the first less 8 will equal the second.

5. Divide the number 45 into three such parts, that the second shall be $\frac{1}{2}$, and the third $\frac{3}{4}$ of the first part.

6. A, B, and C together have 40¢; B has $\frac{2}{3}$ as many as A, and C $\frac{2}{3}$ as many as B. How many cents has each?

SOLUTION.—C has $\frac{2}{3}$ of $\frac{2}{3}$ = $\frac{4}{9}$ as many as A; $\frac{2}{3} + \frac{2}{3} + \frac{4}{9} = \frac{10}{9}$; and $\frac{10}{9}$, or twice as many as A, = 40¢. Hence, A has $\frac{1}{2}$ of 40¢ = 20¢, B has $\frac{2}{3}$ of 20¢ = 12¢, and C has $\frac{2}{3}$ of 20¢ = 8¢.

7. A tree 70 ft. long was broken into 3 pieces; the middle part was $\frac{5}{6}$ of the top part; the lower part was $\frac{2}{3}$ of the middle part. What was the length of each?

8. I bought a hat, a coat, and a vest, for \$34; the hat cost $\frac{2}{5}$ of the price of the coat, and the vest $\frac{3}{4}$ the price of the hat. What was the cost of each?

9. Divide 38¢ between A and B, so that $\frac{2}{3}$ of A's share may be equal to $\frac{2}{3}$ of B's.

SOLUTION. — $\frac{1}{3}$ of A's share is $\frac{1}{3}$ of $\frac{2}{3} = \frac{2}{9}$ of B's, and A's share is 2 times $\frac{2}{9} = \frac{4}{9}$ of B's; then, $\frac{4}{9} + \frac{2}{9} = \frac{6}{9} = \frac{2}{3}$ of B's share, or 38¢. $\frac{1}{3}$ of B's share is $\frac{1}{3}$ of 38¢ = 2¢, and B's share is 10 times 2¢ = 20¢. A's share is $\frac{2}{3}$ of 20¢ = 13¢.

10. In a field containing 55 sheep and cows, $\frac{1}{2}$ of the cows = $\frac{2}{3}$ of the sheep. How many are there of each?

11. The sum of two numbers is 60; and $\frac{1}{3}$ of the less equals $\frac{2}{3}$ of the greater. What are the numbers?

12. One fourth of Mary's age = $\frac{1}{3}$ of Sarah's, and the sum of their ages is 14 years. What is the age of each?

13. Divide the number 51 into two such parts that $\frac{2}{3}$ of the first will equal $\frac{2}{3}$ of the second.

14. In an orchard of 65 apple and peach trees, $\frac{2}{3}$ of the apple trees equal $\frac{1}{3}$ of the peach trees. How many are there of each?

15. From C to D is 66 mi.; A left C at the same time B left D; when they met, $\frac{2}{3}$ of the distance A had traveled equaled $\frac{1}{3}$ of the distance B had traveled. How much farther did B travel than A?

16. The time past noon is equal to half the time till midnight. What o'clock is it?

SOLUTION. — The time past noon plus the time to midnight equals 12 hours. Since the time past noon is $\frac{1}{2}$ the time to midnight, and the time to midnight $\frac{2}{3}$ the time to midnight, $\frac{1}{2} + \frac{2}{3}$ or $\frac{7}{6}$ time to midnight = 12 hr. Therefore the time to midnight = $\frac{1}{7}$ of 2×12 hr. = 8 hr. and the time past noon 12 hr. - 8 hr. = 4 hr. The time is 4 P.M.

17. The time elapsed since noon is $\frac{2}{3}$ of the time to midnight. What is the hour?

18. The time past noon, plus 3 hr., is equal to $\frac{1}{2}$ of the time to midnight. What is the hour?

19. What is the hour in the afternoon, when the time past noon is equal to $\frac{1}{6}$ of the time past midnight?

20. What is the hour in the afternoon, when the time past noon is $\frac{1}{4}$ of the time past midnight?

21. What is the hour of the day, when $\frac{1}{2}$ of the time past noon is $\frac{1}{20}$ of the time past midnight?

LESSON LXVIII

1. What number is that to which, if its half is added, the sum will be 15?

SOLUTION. — $\frac{1}{2} + \frac{1}{2} = 1$; $\frac{1}{2}$ of the number = 15. Hence, $\frac{1}{2}$ of the number is $\frac{1}{2}$ of 15 = 5, and the number is 2 times 5 = 10.

2. What number is that to which if its $\frac{2}{3}$ is added, the sum will be 20?

3. If to Mary's age its $\frac{2}{3}$ is added, the sum will be 21 years. What is her age?

4. What number is that which when doubled, and increased by its $\frac{2}{3}$, will equal 52?

5. What number is that which when doubled, and diminished by its $\frac{1}{3}$, will equal 40?

6. What number is that which when trebled, and diminished by its $\frac{2}{3}$, will equal 48?

7. If to David's age you add its $\frac{1}{2}$ and its $\frac{2}{3}$, the sum will be 26. What is his age?

8. If to Ida's age you add its $\frac{1}{3}$, its $\frac{1}{4}$, and ten years, the sum will be twice her age. How old is she?

SOLUTION. — Her age, $\frac{1}{3} + \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$. Since $\frac{1}{2} + 10$ years = twice her age, or $\frac{1}{2} + \frac{1}{2} = 1$; $\frac{1}{2} = 10$ years. Therefore her age is $\frac{1}{2}$ of 12×10 years = 24 years.

9. Thomas spent $\frac{2}{5}$ of his money, and had 30 cents left. How much had he at first?

10. If to a certain number you add its $\frac{1}{2}$, and its $\frac{2}{3}$, plus 27, the number will be trebled. What is the number?

11. A father is 40 years older than his son; the son's age is $\frac{3}{11}$ of the father's age. What is the age of each?

12. If to Susan's age you add its $\frac{4}{5}$, plus 18 years, the sum will be 3 times her age. How old is she?

13. A piece of flannel, having lost $\frac{2}{3}$ of its length by shrinkage, measured 28 yards. What was its length?

LESSON LXIX

1. If A can do a piece of work in 2 days, what part of it can he do in 1 day?

2. A boy can read a book in 10 hours. What part of it can he read in 1 hour?

3. B can do a piece of work in $\frac{1}{2}$ a day. How many times the work can he do in 1 day?

4. C can mow a certain lot in $\frac{3}{8}$ of a day. How many such lots can he mow in a day?

5. A can mow a certain field in $2\frac{1}{2}$ days. What part of it can he mow in 1 day?

6. B can dig a trench in $3\frac{1}{2}$ days. What part of it can he dig in 1 day?

7. C can walk from Cincinnati to Dayton in $3\frac{1}{8}$ days. What part of the distance can he walk in 2 days?

8. A can do $\frac{1}{2}$ of a piece of work in 1 day, and B $\frac{1}{4}$ of it. What part of the work can both do in a day?

9. A can do $\frac{1}{2}$, B $\frac{1}{4}$, and C $\frac{1}{8}$ of a piece of work in 1 day. What part of it can they all do in a day?

10. If A can do a piece of work in 2 days, and B in 3 days, in what time can they both together do it?

SOLUTION. — A and B can do $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ of the work in 1 day; then they can do $\frac{1}{6}$ of the work in $\frac{1}{5}$ of a day, and the whole work in $\frac{6}{5} = 1\frac{1}{5}$ days.

11. A can dig a trench in 6 days, and B in 12 days. In what time can they both together do it?

12. C alone can do a piece of work in 5 days, and B in 7 days. In what time can both do it?

13. A can do a piece of work in 2 days, B in 3 days, and C in 6 days. In what time can all three do it?

14. A and B mow a field in 4 days; B can mow it alone in 12 days. In what time can A mow it?

SOLUTION.—B can mow $\frac{1}{4} - \frac{1}{12} = \frac{1}{6}$ of the field in one day; hence he can mow the whole field in 6 days.

15. A man and his wife can drink a quantity of Vichy in 12 days; when the man is away, it lasts the woman 30 days. In what time can the man drink it alone?

16. Three men, A, B, and C, can together reap a field of wheat in 4 days; A can reap it alone in 8 days, and B in 12 days. In what time can C reap it?

17. A can do $\frac{1}{2}$ a piece of work in a day, and B $\frac{1}{3}$ of it in a day. How long will it take both to do it?

18. A can dig a cellar alone in $2\frac{1}{2}$ days, and B in $3\frac{1}{3}$ days. In what time can both together dig it?

19. C can reap a field of wheat in 5 days, and D in $3\frac{1}{2}$ days. In what time can both reap it?

RATIO

LESSON LXX

1. What part of 8 is 2? What part is 4? Is 1?
2. How many times does 10 contain 2? 2 is what part of 10?

Ratio is the relation of two numbers expressed by their quotient.

3. What is the ratio of 12 to 2?

SOLUTION.—The ratio of 12 to 2 is $12 \div 2 = 6$.

4. How many times does 18 contain 9? What is the ratio of 18 to 9?

What is the ratio of:

- | | | |
|--------------|------------------------------------|---------------------------------------|
| 5. 2 to 1 | 15. 3 to 4 | 25. $\frac{2}{3}$ to $\frac{3}{4}$ |
| 6. 1 to 2 | 16. 4 to 3 | 26. $\frac{3}{4}$ to $\frac{2}{3}$ |
| 7. 36 to 12 | 17. 35 to 7 | 27. $2\frac{1}{2}$ to 5 |
| 8. 12 to 36 | 18. 7 to 35 | 28. 5 to $2\frac{1}{2}$ |
| 9. 66 to 11 | 19. 56 to 8 | 29. $6\frac{1}{4}$ to $12\frac{1}{2}$ |
| 10. 11 to 66 | 20. 8 to 56 | 30. $12\frac{1}{2}$ to $6\frac{1}{4}$ |
| 11. 45 to 9 | 21. $\frac{1}{2}$ to $\frac{1}{4}$ | 31. $4\frac{2}{3}$ to $2\frac{1}{3}$ |
| 12. 9 to 45 | 22. $\frac{1}{4}$ to $\frac{1}{2}$ | 32. $2\frac{1}{3}$ to $4\frac{2}{3}$ |
| 13. 52 to 13 | 23. $\frac{2}{3}$ to $\frac{5}{6}$ | 33. $1\frac{1}{2}$ to 6 |
| 14. 13 to 52 | 24. $\frac{5}{6}$ to $\frac{2}{3}$ | 34. 6 to $1\frac{1}{2}$ |

35. If the ratio of two numbers is 5, and 6 is the less number, what is the greater?

36. The ratio of 21 to 7 is equal to the ratio of 36 to some number. What is the number?

37. Five less than the ratio of 20 to 2 is $\frac{1}{4}$ of the ratio of 40 to what number?

38. The ratio of 18 to 2, plus 3, is 7 less than the ratio of 38 to what number?

39. The ratio of 27 to 9, increased by 5, is equal to the ratio of 20 to what number?

40. If 3 oranges cost 5 cents, how much do 12 oranges cost?

SOLUTION. — The ratio of 12 to 3 is 4. Therefore 12 oranges cost 4 times 5 cents, or 20 cents.

41. If $\frac{5}{8}$ of a yard of lace costs \$5, how much does $\frac{1}{2}$ a yard cost?

SOLUTION. — The ratio of $\frac{1}{2}$ to $\frac{5}{8}$ is $\frac{4}{5}$. Therefore, $\frac{1}{2}$ a yard costs $\frac{4}{5}$ of \$5, or \$4.

42. If 6 rolls cost 5 cents, how much do 18 rolls cost?

43. If $\frac{3}{8}$ of a yard of silk costs 30¢, how much will $\frac{3}{4}$ of a yard cost?

44. If $\frac{3}{16}$ of a house costs \$300, how much is $\frac{5}{8}$ of it worth?

45. The ratio of the circumference of a circle to its diameter is $2\frac{2}{7}$. Find the circumference of a circle whose diameter is 14 inches.

46. If 12 pencils cost 10 cents, how many can be bought for \$1?

47. When eggs sell 13 for 25 cents, how many eggs can be bought for 75 cents?

48. At 3 for 5 cents, how many lemons can be bought for 75 cents?

LESSON LXXI

1. What is the ratio of $12\frac{1}{2}$ to $37\frac{1}{2}$?

SOLUTION. — $12\frac{1}{2} = \frac{1}{8}$ of 100 and $37\frac{1}{2} = \frac{3}{8}$ of 100 (Lesson LIII). Therefore the ratio of $12\frac{1}{2}$ to $37\frac{1}{2}$ is the same as the ratio of $\frac{1}{8}$ to $\frac{3}{8}$, which is $\frac{1}{3}$.

What is the ratio of:

- | | | |
|---------------------------------------|--|--|
| 2. $12\frac{1}{2}$ to 25 | 7. 20 to $62\frac{1}{2}$ | 12. $37\frac{1}{2}$ to $87\frac{1}{2}$ |
| 3. $12\frac{1}{2}$ to $87\frac{1}{2}$ | 8. $62\frac{1}{2}$ to 20 | 13. $16\frac{2}{3}$ to $33\frac{1}{3}$ |
| 4. $12\frac{1}{2}$ to 75 | 9. $37\frac{1}{2}$ to 50 | 14. $12\frac{1}{2}$ to $62\frac{1}{2}$ |
| 5. $16\frac{2}{3}$ to $66\frac{2}{3}$ | 10. $33\frac{1}{3}$ to $16\frac{2}{3}$ | 15. $16\frac{2}{3}$ to $83\frac{1}{3}$ |
| 6. 75 to 25 | 11. $87\frac{1}{2}$ to $12\frac{1}{2}$ | 16. $37\frac{1}{2}$ to $87\frac{1}{2}$ |

17. At $12\frac{1}{2}$ cents a yard, how many yards of ribbon can be bought for 75 cents? For 50 cents?

18. At $33\frac{1}{3}$ cents a pound, how many pounds of coffee can be bought for \$1?

19. At $16\frac{2}{3}$ cents a pound, how many pounds of cheese can be bought for \$2?

20. At $37\frac{1}{2}$ cents a yard, how many yards of ribbon can be bought for \$1.50?

21. At $87\frac{1}{2}$ cents a yard, how many yards of flannel can be bought for \$1.75?

22. Divide 25¢ between George and John, so that their shares shall be in the ratio of 3 to 2.

SOLUTION. — George's share is $3 \div 2 = \frac{3}{2}$ of John's; $\frac{3}{2} + \frac{3}{2} = \frac{6}{2}$; $\frac{3}{2}$ of John's share are 25¢. Hence, John's share is 10¢, and George's 15¢.

23. Divide the number 48 into two parts that shall be in the ratio of 5 to 7.

24. Divide 20 apples between A and B, so that A may get 2 as often as B gets 3.

25. Divide 28 cents between John and James, so that John may get 3 as often as James gets 4.

26. In an orchard of 96 trees there are 5 apple trees to 3 peach trees. How many of each kind are there?

27. A school of 35 pupils has 2 boys to 3 girls. How many girls and how many boys are there in the school?

28. What number is that which being added to 3 times itself will make 48?

29. Mary has 25 yd. of ribbon. She wishes to divide it into two parts, so that one shall be 4 times the length of the other. What must be the length of each part?

30. Divide 28 into two parts, so that one will be to the other as 3 to 4.

31. A and B hired a pasture for \$45. A pastured 4 cows, and B, 5 cows. How much should each pay?

32. Two ladies paid \$3 for $7\frac{1}{2}$ dozen cut steel buttons. The first paid \$2, and the second, \$1. How many dozen should each have?

33. A and B bought a horse for \$40; A paid \$25 and B the rest. They sold him for \$56. How much should each receive?

34. C and D sold a horse for \$30 less than it cost; C's share was to D's as 3 to 2. What was each one's loss?

LESSON LXXII

1. Divide the number 22 into two parts that shall be to each other as $2\frac{1}{2}$ to 3.

SOLUTION.—The first part is $2\frac{1}{2} \div 3 = \frac{5}{6}$ of the second; $\frac{5}{6} + \frac{5}{6} = \frac{10}{6}$; $\frac{10}{6}$ of the second part = 22. Hence, the second part is 12 and the first 10.

2. Divide 16 apples between Henry and Frank, so that their shares shall be in the ratio of $1\frac{1}{2}$ to $2\frac{1}{2}$.

3. Divide 14¢ between A and B, so that B may have $1\frac{1}{3}$ times as many as A.

4. John and James have together 33 marbles; James has $1\frac{3}{4}$ times as many as John. How many has each?

5. Two boys bought a silver watch for \$7. The first paid $\$2\frac{1}{2}$, the second, $\$4\frac{1}{2}$, and they sold it for \$28. What was each one's share?

6. William's age is $1\frac{3}{5}$ times Frank's age; the sum of their ages is 32 yr. What is the age of each?

7. A basket contains 30 apples. The number of sound ones is $2\frac{1}{2}$ times the number not sound. How many are there of each?

8. Two men built 27 ft. of wall. How much did each build, if one built $\frac{2}{3}$ as much as the other?

9. Divide the number 60 into 3 parts that shall be to each other as 3, 4, and 5.

SOLUTION. — $\frac{3}{3} + \frac{4}{3} + \frac{5}{3} = \frac{12}{3}$; $\frac{12}{3}$ of the first part = 60. Then, the first part is 15, the second 20, and the third 25.

10. Divide the number 70 into four parts that shall be to each other as 1, 2, 3, and 4.

11. Divide 39 into three parts that shall be to each other as $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$.

12. William had 3¢, Thomas 4¢, and John 5¢. They bought 36 peaches. What was the share of each?

13. A boat worth \$864, of which $\frac{1}{8}$ belonged to A, $\frac{1}{4}$ to B, and the rest to C, was lost. What loss did each sustain if it was insured for \$500?

14. A, B, and C have \$42; B has $\frac{1}{2}$ as much as A, and C $\frac{1}{2}$ as much as B. How much has each?

15. Divide 45¢ among A, B, and C, so that A may get 4¢ as often as B gets 3¢ and C 2¢.

16. On a farm there are 60 animals — horses, cows, and sheep; for each horse there are 3 cows, and for each cow there are 2 sheep. How many animals of each kind are there?

17. Divide 42 plums among A, B, and C, so that B may get twice and C 3 times as many as A.

18. Divide 35 cherries among Edith, Kate, and Alice, so that Kate shall have twice as many as Edith and Alice twice as many as Kate.

LESSON LXXIII

1. If 5 men can do a piece of work in 18 da., how many men can do it in 9 da. ?

SOLUTION. — In 1 day, 18 times 5 men = 90 men can do the work. Hence, in 9 days, $\frac{1}{9}$ of 90 men = 10 men can do it.

2. If 8 men can do a piece of work in 15 da., how many men can do it in 12 da. ?

3. If 8 men can do a piece of work in 5 da., in what time can 5 men do it ?

4. If 9 pipes fill a cistern in $2\frac{1}{2}$ hr., in what time will 5 such pipes fill it ?

5. A man, failing in business, paid 80¢ on each dollar of his indebtedness. How much did I receive, if he owed me \$60 ?

SOLUTION. — $80\% = \frac{4}{5}$. I received 60 times $\frac{4}{5} = \$48$.

6. A grocer, failing, pays only 15¢ on the dollar. How much will a creditor receive to whom he owes \$80 ?

7. A trader, failing, pays 60¢ on the dollar. How much will a creditor receive to whom he owes \$80 ?

8. If a certain quantity of flour makes 8 five-cent loaves, how many ten-cent loaves will it make ?

SOLUTION. — It will make 5 times 8, or 40, one-cent loaves; and $\frac{1}{5}$ of 40, or 4, ten-cent loaves.

9. If a certain quantity of flour makes 6 five-cent loaves, how many three-cent loaves will it make ?

10. If a sack of flour makes 20 three-cent loaves, how many four-cent loaves will it make ? How many five-cent loaves ?

11. If a loaf weighs 8 oz. when flour is \$3 a barrel, how much should it weigh when flour is \$4 a barrel ? \$5 a barrel ?

12. A loaf weighs 10 ounces when flour is \$6 a barrel. How much should it weigh when flour is \$5 a barrel?

13. If a loaf weighs 7 ounces when flour is $\$5\frac{1}{2}$ a barrel, how much ought it to weigh when flour is $\$4\frac{2}{3}$ a barrel?

14. If 5 men can do a piece of work in a certain time, how many can do a piece twice as large in $\frac{1}{2}$ of the time?

15. If 6 men can do a piece of work in 5 days, in what time can they do it, if they receive the assistance of 3 additional men when the work is half completed?

16. If 7 men can do a piece of work in 4 days, in what time can it be done, if 3 of the men leave when the work is half completed?

17. If 4 men can do a piece of work in 8 days, in what time can they do it if they receive the assistance of 4 men when the work is one fourth done?

LESSON LXXIV

1. A and B rent a pasture for \$25. A puts in 27 oxen, and B, 180 sheep. How much should each pay, supposing an ox to eat as much as 10 sheep?

SOLUTION.—180 sheep eat as much as $180 \div 10 = 18$ oxen. B should pay $18 \div 27 = \frac{2}{3}$ as much as A; $\frac{2}{3} + \frac{2}{3} = \frac{4}{3}$; $\frac{3}{4}$ of what A should pay are \$25. Then, A should pay \$15, and B, \$10.

2. A and B rent a pasture for \$60. A puts in 14 horses, and B, 15 cows. How much should each pay, if 2 horses eat as much as 3 cows?

3. A and B rent a pasture for \$72. A puts in 8 horses, B, 15 oxen and 120 sheep. How much should each pay, if a horse eats as much as 20 sheep, and 2 horses as much as 3 oxen?

4. A and B rent a pasture for \$35. A puts in 4 horses 2 wk. ; B, 3 horses 4 wk. How much ought each to pay ?

SOLUTION. — 4 horses in 2 wk. eat the same as 1 horse in 4 times 2 wk. = 8 wk.; and 3 horses in 4 wk. eat the same as 1 horse in 3 times 4 wk. = 12 wk. Hence B ought to pay $12 \div 8 = \frac{3}{2}$ as much as A, or \$3 when A pays \$2; therefore A pays \$14, and B, \$21.

5. Mr. Allen and Mr. Blake engage in trade. Mr. Allen's capital is \$200; Mr. Blake's, \$300. They gain \$100. Find each partner's share.

6. A and B form a partnership, with a capital of \$800. A's part is \$300; B's, \$500. They gain \$200. What is the share of each?

7. Three men entered into partnership. A's stock was \$70; B's, \$150; C's, \$80. They gained \$120. What was each man's share of it?

8. C and D join their stocks in trade. C puts in \$50 for 4 mo., and D, \$60 for 5 mo. They gain \$45. What is the share of each?

9. A put in trade \$25 for 2 mo.; B, \$20 for 5 mo. They gained \$30. What was each man's share?

10. Three men engaged in business together. A put in \$300 for 5 mo.; B, \$600 for 5 mo.; C, \$500 for 3 mo. They lost \$100. Find each one's loss.

11. Divide \$90 among 3 persons, so that the parts shall be to each other as 1, 3, and 5.

12. A, B, and C form a partnership. A puts in \$200 for 10 months, B \$300 for 1 year, and C \$100 for 4 months. They gain \$150. What is each one's share of the gain?

13. Two masons, A and B, built a wall for \$81. A sent 3 men for 4 da., and B, 5 men for 3 da. How much ought each to receive?

14. A and B traded in company. A put in \$2 as often as B put in \$3; A's money was employed 5 mo., and B's, 4 mo. They gained \$55. What was each man's share?

15. E and F rented a field for \$27. E put in 4 horses for 5 mo., and F, 10 cows for 6 mo. How much ought each to pay, if 2 horses eat as much as 3 cows?

16. M and N enter into partnership for one year. M puts in \$600, and N, \$900; they gain \$300. After paying \$150 expenses, what is each one's share of the gain?

17. At the beginning of the year, C went into business with a capital of \$600. Four months later, D formed a partnership with C, and put in \$600. The gain for the year was \$250. What was each one's share?

18. E and F entered into partnership for a year. E's capital was \$1000, and F's, three times as much. At the end of 8 months, F drew out \$1000; the gain for the year was \$770. What was each one's share?

19. The capital of a firm, consisting of A and B, was \$2400; the gain for the year was \$240, A's share being \$20 more than B's. How much capital did each furnish?

20. The capital of a firm, consisting of C and D, was \$980; C's capital was used 8 months, and D's, 6 months. Then the gain was equally divided. How much capital did each invest?

21. In a partnership, A's gain was \$70, and B's, \$80. A's capital was employed 10 months, and B's, 8 months. Their joint capital was \$1700. What was the original investment of each?

22. The gain of a firm, consisting of E and F, was \$840. E's stock was to F's as 2 to 3, and E's was in use 10 months, F's, 12 months. What was each one's share of the gain?

PERCENTAGE

LESSON LXXV

Any per cent of a number is so many *hundredths* of it; thus, one per cent of a number is $\frac{1}{100}$ of it. The sign for per cent is %.

1. What part is 2%?

SOLUTION. — 2 per cent is $\frac{2}{100} = \frac{1}{50}$.

2. What part is 4%? 5%? 6%?
3. What part is 8%? 12%? 15%?
4. What part is 16%? 22%? 24%?
5. What part is 26%? 28%? 30%?
6. What part is 32%? 35%? 36%?
7. What part is 38%? 45%? 48%?
8. What part is 52%? 55%? 65%?
9. What part is $2\frac{1}{2}\%$?

SOLUTION. — $2\frac{1}{2} = \frac{5}{2}$. 1 per cent is $\frac{1}{100}$; hence, $\frac{1}{2}$ per cent is $\frac{1}{2}$ of $\frac{1}{100} = \frac{1}{200}$, and $\frac{5}{2}$ per cent is 5 times $\frac{1}{200} = \frac{1}{40}$.

What part is:

10. $3\frac{1}{2}\%$? 10 %? 25 %? $43\frac{3}{4}\%$? 80 %?
11. $6\frac{1}{4}\%$? $12\frac{1}{2}\%$? 30 %? 50 %? $83\frac{1}{8}\%$?
12. $6\frac{2}{3}\%$? $16\frac{2}{3}\%$? $33\frac{1}{3}\%$? $62\frac{1}{2}\%$? $87\frac{1}{2}\%$?
13. $7\frac{1}{2}\%$? $18\frac{3}{4}\%$? $37\frac{1}{2}\%$? $66\frac{2}{3}\%$? 90 %?
14. $8\frac{1}{3}\%$? 20 %? 40 %? 75 %? 95 %?

LESSON LXXVI

1. What is 4% of 50?

SOLUTION. — 4% is $\frac{4}{100}$; $\frac{4}{100}$ of 50 = 2.

2. What is 6% of 50? 100?

3. What is 10 % of 20? 30?
4. What is $12\frac{1}{2}\%$ of 24? 48?
5. What is 25 % of \$32? \$80?
6. What is $33\frac{1}{3}\%$ of 51 bushels?
7. What is 50 % of 14 horses?

✓ 8. Mr. Arnold bought a piece of cloth for \$32, and sold it so as to gain $6\frac{1}{4}\%$. How much did he gain?

SOLUTION. — $6\frac{1}{4}\%$ is $\frac{1}{8}\%$. He gained $\frac{1}{8}$ of \$32 = \$2.

9. A dealer bought a table for \$10, and in selling it gained 10%. How much did he gain?

10. A farmer, having a flock of 40 sheep, lost 5% of them. How many had he left?

11. A flock of 50 sheep increases 10% in one year. How many are then in the flock?

12. A lady, having \$20, spent 10% for muslin, and 10% of the remainder for calico. How much did she pay for both?

13. A man paid 30¢ per yard for cambric. At what price must he sell it, to make 10%?

SOLUTION. — 10% is $\frac{1}{10}\%$. He must gain $\frac{1}{10}$ of 30¢ = 3¢. Then he must sell it for 30¢ + 3¢ = 33¢.

14. To make $12\frac{1}{2}\%$ profit, for how much must muslin be sold that cost 8¢ per yard? 16¢?

15. To make $8\frac{1}{3}\%$ profit, for how much must sugar be sold that cost 6¢ per pound?

16. To make 25% profit, for how much must delaine be sold that cost 12¢ per yard? 16¢? 20¢? 35¢?



LESSON LXXVII

1. How many per cent is $\frac{1}{2}$?

SOLUTION. — It is $\frac{1}{2}$ of 100 per cent = 50 per cent.

How many per cent is:

2. $\frac{1}{3}$? $\frac{2}{3}$? $\frac{1}{4}$? $\frac{3}{4}$? $\frac{1}{5}$? $\frac{2}{5}$? $\frac{3}{5}$? $\frac{4}{5}$? $\frac{1}{6}$?

3.	$\frac{1}{2}?$	$\frac{2}{3}?$	$\frac{3}{4}?$	$\frac{4}{5}?$	$\frac{5}{6}?$	$\frac{6}{7}?$	$\frac{7}{8}?$	$\frac{8}{9}?$	$\frac{9}{10}?$
4.	$\frac{2}{3}?$	$\frac{3}{4}?$	$\frac{4}{5}?$	$\frac{5}{6}?$	$\frac{6}{7}?$	$\frac{7}{8}?$	$\frac{8}{9}?$	$\frac{9}{10}?$	$\frac{10}{11}?$
5.	$\frac{1}{15}?$	$\frac{1}{16}?$	$\frac{2}{16}?$	$\frac{3}{16}?$	$\frac{4}{16}?$	$\frac{5}{16}?$	$\frac{6}{16}?$	$\frac{7}{16}?$	$\frac{8}{16}?$
6.	$\frac{1}{25}?$	$\frac{2}{25}?$	$\frac{3}{25}?$	$\frac{4}{25}?$	$\frac{5}{25}?$	$\frac{6}{25}?$	$\frac{7}{25}?$	$\frac{8}{25}?$	$\frac{9}{25}?$
7.	$\frac{7}{80}?$	$\frac{2}{35}?$	$\frac{3}{40}?$	$\frac{11}{40}?$	$\frac{6}{45}?$	$\frac{5}{48}?$	$\frac{1}{50}?$	$\frac{2}{50}?$	$\frac{7}{50}?$
8.	$\frac{9}{50}?$	$\frac{1}{60}?$	$\frac{1}{75}?$	$\frac{15}{24}?$	$\frac{18}{24}?$	$\frac{21}{24}?$	$\frac{18}{32}?$	$\frac{22}{32}?$	$\frac{26}{32}?$
9.	$\frac{8}{36}?$	$\frac{18}{36}?$	$\frac{30}{36}?$	$\frac{40}{48}?$	$\frac{28}{48}?$	$\frac{38}{48}?$	$\frac{44}{48}?$	$\frac{46}{48}?$	$\frac{12}{80}?$

LESSON LXXVIII

1. Two is what per cent of 5?

SOLUTION.—2 is $\frac{2}{5}$ of 5: $\frac{2}{5} = \frac{40}{100}$ or 40%.

What per cent of

2.	5 is 3?	20 is 4?	4 is 20?
3.	12 is 6?	24 is 8?	8 is 24?
4.	8 is 2?	30 is 15?	15 is 30?
5.	14 is 4?	35 is 7?	7 is 35?
6.	18 is 3?	40 is 20?	100 is 25?
7.	25 is 5?	45 is $22\frac{1}{2}$?	300 is 50?
8.	36 is 9?	50 is $12\frac{1}{2}$?	50 is 300?
9.	45 is 15?	55 is 11?	400 is 80?
10.	50 is 30?	60 is 15?	80 is 400?

11. Five dollars are what per cent of \$20? \$30?

12. Eight men are what per cent of 160 men?

13. There are 36 pupils enrolled in a certain school. If 9 are absent, what is the per cent of absence?

14. Out of 60 pupils in a school, 20 study geography. What per cent is that of the whole number?

15. There are 45 pupils enrolled in a certain primary school; on a certain day only 30 of them were present. What was the per cent of attendance?

16. A grocer buys coffee at 25¢ per pound, and sells it at a profit of 5¢ per pound. What is his gain per cent?

17. A merchant bought cloth at \$5 per yard, and sold it at \$7 per yard. What per cent did he gain?

SOLUTION. — He gained $\$7 - \$5 = \$2$; $\$2 = \frac{2}{5}$ of the cost; $\frac{2}{5} = 40$ per cent.

18. A grocer bought a melon for 4¢, and sold it for 5¢. What per cent did he gain?

19. An orange was bought for 5¢, and sold for 4¢. What was the per cent of loss?

20. Thomas bought a watch for \$4, and sold it for \$6. What per cent did he gain?

21. Henry bought a horse for \$15, and sold it for \$24. What per cent did he gain?

22. A keg of water holding 5 gal. lost 6 qt. by leakage. What was the loss per cent?

23. By selling citrons at 6¢ each, John cleared $\frac{1}{5}$ of the first cost. What per cent would he have cleared by selling them at 8¢ each?

24. A merchant bought cloth at the rate of 6 yd. for \$3, and sold it at the rate of 5 yd. for \$4. What per cent did he gain?

25. A grocer sold melons at 8¢ each, and lost $\frac{1}{5}$ of the first cost. What per cent would he have lost by selling them at 3 for 25¢? What per cent would he have gained by selling them at 2 for 25¢?

26. A grocer bought a lot of lemons, at the rate of 2 for 3¢; but, finding them damaged, he sold them at the rate of 3 for 2¢. What per cent did he lose?

27. 12 is $66\frac{2}{3}\%$ of what number?

SOLUTION. — $66\frac{2}{3}\% = \frac{2}{3}$; 12 is $\frac{2}{3}$ of ($\frac{1}{2}$ of 3×12) = 18.

28. 14 is $87\frac{1}{2}\%$ of what number? 180 is 6% of what number?

29. 15 is 20% of what number? 160 is $62\frac{1}{2}\%$ of what number?

30. 15 is 75% of what number? 300 is $37\frac{1}{2}\%$ of what number?

31. 100 is 125% of what number? 270 is $33\frac{1}{3}\%$ of what number?

32. 90 is 90% of what number? 500 is 40% of what number?

LESSON LXXIX

1. A man sold a watch for \$12, and gained 20%. What was the cost?

SOLUTION.—20% is $\frac{1}{5}$; $\frac{1}{5} + \frac{1}{5} = \frac{2}{5}$; $\frac{2}{5}$ of the cost are \$12; hence, the cost is \$10.

2. I sold a piece of cloth for \$26, and gained 30%. How much did the cloth cost me?

3. If there is a gain of 40% when muslin is sold at 14¢ a yard, what is the cost price?

4. By selling a horse for \$81, there was a gain of $12\frac{1}{2}\%$. How much did the horse cost?

5. I sold a horse for \$63, and lost 10%. What was the cost?

6. Thomas sold a watch for \$21, and gained 75%. How much did he pay for it?

7. James sold 10 oranges for 40¢, and gained $33\frac{1}{3}\%$. How much did each orange cost?

8. A jeweler sold a watch for \$10, by which he gained 25%. How much would he have gained by selling it for \$12?

9. By selling muslin at 7¢ per yard, there is a loss of $12\frac{1}{2}\%$. What will be the loss per cent by selling it at 6¢ per yard?

10. By selling my horse for \$35, there was a loss of $16\frac{2}{3}\%$. What would have been the gain per cent by selling him for \$63?

11. I bought a watch for \$18, which was 20% more than its value. I sold it at 10% less than its value. What sum did I lose?

12. A sold B a watch for \$60, and gained 20%. Afterward B sold it and lost 20% on what it cost him. How much did B lose more than A gained?

13. A watchmaker sold two watches for \$30 each. On one he gained 25%, and on the other he lost 25%. How much did he lose by the sale?

14. By selling 4 apples for 3¢, a dealer gains 50%. What per cent will he gain by selling them at the rate of 5 for 4¢?

15. I sold 5 lemons for 4¢, and lost 20%. What per cent did I lose by selling 6 for 5¢?

16. Two thirds of 10% of 60 are $\frac{1}{2}$ of what per cent of 40?

17. One half of $\frac{3}{5}$ of 50% of 120 is 10 less than 20% of what?

18. One fourth of $\frac{3}{5}$ of 60% of 10 is 5 less than 50% of what?

19. Three fourths of $\frac{2}{3}$ of 75% of 15 are $1\frac{2}{3}$ more than 50% of what?

20. One and one half times $\frac{2}{3}$ of 25% of 4 are 25% of $\frac{1}{2}$ of what number?

LESSON LXXX

Allowances made to purchasers by wholesale dealers are called **discounts**, or **per cents off**.

10% discount or 10% off means 10%, or $\frac{1}{10}$, from the retail, or list price.

$\frac{1}{8}$ off means $\frac{1}{8}$, or $12\frac{1}{2}\%$, from the list price.

20/5 (read 20 and 5) means 20% off, and 5% taken from the remainder.

$\frac{1}{8}$ and 5 means $12\frac{1}{2}\%$ off, and 5% taken from the remainder.

PERCENTAGE

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Begin

1. The price of a book was \$3, but the bookseller allowed 20% off. How much was paid for the book? *\$2.40*
2. The amount of a bill of goods was \$125, but the dealer allowed $\frac{1}{5}$ off. How much was paid for the goods? *\$100*
3. A bill of goods amounted to \$840, and the dealer gave $\frac{1}{6}$ off. How much was paid for the goods? *\$760*
4. A lot of books amounted to \$500. The bookseller allowed 20/5 off. How much was paid for the books? *\$380*
5. A bill of goods amounted to \$1200, and the dealer allowed $\frac{1}{6}$ and 5 off. How much was paid for the goods? *\$800*
6. I paid \$4.80 for a book, the bookseller having allowed 20% off. What was the list price? *\$6.00*
7. I paid \$720 for a bill of goods, the dealer having allowed $\frac{1}{3}$ off. What was the list price? *\$1080*
8. I paid \$133 for goods, the dealer having allowed 20/5. What was the list price? *\$167.58*
9. I paid \$399 for goods, the dealer having allowed $\frac{1}{3}$ and 5% for cash; I sold them at the list price. How much did I get for the goods? *\$471.82*
10. The list price of a bill of goods was \$70; the dealer allowed 20/5 on \$50, and 10/5 on the remainder of the amount. How much was paid for the goods? *\$51.80*

LESSON LXXXI

Commission is the sum allowed to agents for buying, selling, or transacting other business.

1. An agent sold a house for \$4000, charging $2\frac{1}{2}\%$ commission. What was his commission?
2. An agent sells goods to the amount of \$560, at 5% commission. What is the commission?
3. A commission merchant sells 1000 bu. of corn, for 50¢ a bu., and charges $2\frac{1}{2}\%$ for selling. What is his commission?

4. An agent sells 5 village lots, for \$300 each, charging 5%. What is his commission, and how much does the owner receive?

5. A farmer sends 800 bu. of wheat to a commission merchant, who sells it at \$1.25 a bu. and charges 2% commission. How much does the farmer receive for his wheat?

6. A collector received \$100 for collecting bills, at 5% commission. How much did he collect?

7. A merchant allowed a collector 10% for collecting bills. The commission was \$60. How much was collected?

8. A commission merchant sold grain for \$1000, charging 5%, and invested the remainder in shares of stock at \$50 a share, without extra charge. How many shares did he buy?

LESSON LXXXII

A **policy** is the written agreement of an Insurance Company to pay a certain sum of money in case of loss by fire, water, accident, or other hazard.

The **premium** is the sum paid for insurance.

1. What is paid for an insurance policy of \$2000, at $\frac{1}{2}\%$ premium?

2. A house worth \$3000 is insured for $\frac{1}{2}$ its value, at 2% premium. What is the insurance?

3. How much does it cost to insure property worth \$2400, for $\frac{2}{3}$ its value, at 1%?

4. A man insured his house for \$2500, and his barn for \$1500, at a premium of $\frac{3}{4}\%$. How much did he pay?

5. A man's house was worth \$1800, and his furniture, \$1200. He insured both at $\frac{2}{3}$ their value, paying 1% premium on the house, $\frac{1}{2}\%$ premium on the furniture. How much did he pay?

6. A man's house was worth \$2600, and his furniture, \$1500. He insured the house at $\frac{1}{2}$ its value, and the furniture at $\frac{2}{3}$ its value. He paid 2% premium on the house, 1% on the furniture. How much did he pay?

LESSON LXXXIII

Interest is money paid for the use of money.

The **principal** is the sum of money which is lent.

The **amount** is the principal and interest added together.

1. What is the interest of \$2 for 3 yr., at 5 per cent?

SOLUTION.—The interest for 3 yr. is 3 times 5 per cent = 15 per cent; 15 per cent is $\frac{3}{20}$; $\frac{3}{20}$ of \$2 = 30¢.

2. Find the interest of \$5 for 2 yr., at 6%.
3. Find the interest of \$8 for 5 yr., at 5%.
4. Find the interest of \$20 for 3 yr., at 8%.
5. Find the interest of \$25 for 6 yr., at 4%.
6. Find the interest of \$40 for 4 yr., at 5%.
7. Find the interest of \$50 for 3 yr., at 6%.
8. Find the interest of \$60 for 2 yr., at 7%.
9. Find the interest of \$75 for 3 yr., at 4%.
10. Find the interest of \$80 for 5 yr., at 9%.

LESSON LXXXIV

1. Find the interest of \$50 for 6 mo., at 6%.

SOLUTION.—6 mo. are $\frac{1}{2}$ yr.; the interest for $\frac{1}{2}$ yr. is $\frac{1}{2}$ of 6 per cent = 3 per cent; 3 per cent is $\frac{3}{100}$; $\frac{3}{100}$ of \$50 = \$1.50.

2. Find the interest of \$60 for 4 mo., at 5%.
3. Find the interest of \$80 for 7 mo., at 6%.
4. Find the interest of \$40 for 9 mo., at 8%.
5. Find the interest of \$75 for 8 mo., at 9%.
6. What is the interest of \$120 for 6 mo. 15 da., at 6%?

SOLUTION.—6 mo. 15 da. are $\frac{1\frac{1}{2}}{2}$ yr.; the interest for $\frac{1\frac{1}{2}}{2}$ yr. is $\frac{1\frac{1}{2}}{2}$ of 6% = $\frac{1\frac{1}{2}}{4}$ %; $\frac{1\frac{1}{2}}{4}$ % is $\frac{3}{800}$; $\frac{3}{800}$ of \$120 = \$3.90.

What is the interest of:

7. \$180 for 10 mo. 10 da., at 4%?

8. \$45 for 11 mo. 23 da., at 8%?

SOLUTION.—The interest of \$45 for 1 year is \$3.60; for 1 month, $\frac{1}{12}$ of \$3.60 = 30¢; and for 1 day, $\frac{1}{30}$ of 30¢ = 1¢. The interest for 11 months is, therefore, \$3.30; for 23 days, 23¢; and the total interest is \$3.53.

9. \$200 for 4 mo. 24 da., at 6%?

10. \$480 for 9 mo. 18 da., at 5%?

11. \$360 for 5 mo. 19 da., at 5%?

12. \$144 for 8 mo. 25 da., at 4%?

13. \$40 for 1 yr. 4 mo., at 6%?

14. \$60 for 2 yr. 3 mo., at 5%?

15. \$75 for 1 yr. 3 mo., 6 da., at 4%?

What is the amount of:

16. \$25 for 3 yr., at 4%?

17. \$40 for 2 yr., at 5%?

18. \$55 for 3 yr., at 8%?

19. \$30 for 1 yr. 4 mo., at 7%?

20. \$50 for 2 yr. 3 mo. 6 da., at 6%?

21. \$90 for 1 yr. 3 mo. 6 da., at 8%?

LESSON LXXXV

1. The interest of a certain principal for 2 yr., at 6%, is \$3. What is the principal?

SOLUTION.—The interest is $12\% = \frac{12}{100}$; then, $\frac{12}{100}$ of the principal = \$3; hence, the principal is \$25.

2. The interest of a certain principal for 3 yr., at 4%, is \$6. What is the principal?

3. What principal at interest for 4 yr., at 5%, will produce \$12 interest?

4. What principal at interest for 5 yr., at 8%, will produce \$30 interest?
5. What principal at interest for 4 yr., at $7\frac{1}{2}\%$, will produce \$42 interest?
6. What principal at interest for 2 yr. 6 mo., at 6%, will produce \$36 interest?
7. What principal at interest for 3 yr. 4 mo., at 6%, will produce \$70 interest?
8. A father wishes to place such a sum at interest, at 5%, as will produce for his son an annual income of \$200. What sum must he invest?

LESSON LXXXVI

1. What principal on interest for 2 yr., at 5%, will amount to \$55?

SOLUTION.—The interest is $10\% = \frac{1}{10}$; $\frac{1}{10} + \frac{1}{10} = \frac{2}{10}$; $\frac{2}{10}$ of the principal = \$55; whence the principal is \$50.

What principal on interest:

2. At 6%, for 3 yr., will amount to \$236?
3. At 5%, for 4 yr., will amount to \$600?
4. At 10%, for 5 yr., will amount to \$375?
5. At 6%, for 5 yr., will amount to \$390?
6. The amount due on a note which has been on interest 3 yr. 4 mo., at 6%, is \$30. What is the face of the note?
7. The amount of two fifths of A's money on interest for 2 yr. 6 mo., at 8%, is \$60. What is his whole principal?

LESSON LXXXVII

1. In what time, at 6%, will \$50 give \$10 interest?

SOLUTION.—The interest for 1 year is \$3; hence, the time will be as many years as \$3 are contained times in \$10, which are $3\frac{1}{3} = 3$ yr 4 mo.

In what time :

2. At 5 %, will \$40 give \$8 interest ?
3. At 8 %, will \$75 give \$15 interest ?
4. At 10 %, will \$60 give \$16 interest ?
5. At 5 %, will \$140 give \$24 interest ?
6. At 6 %, will \$25 give \$10 interest ?
7. In what time, at 4 %, will any given principal double itself ?

SOLUTION. — Any principal will double itself in as many years as 4 % is contained times in 100 %, which are 25.

8. In what time will any given principal double itself, at 2 % ? At 3 % ? At 5 % ? At 6 % ? At 7 % ? At 8 % ? At 10 % ? At 12 % ?

9. In what time will any given principal treble itself, at 5 % ?

10. In what time will any given principal treble itself, at 8 % ? At 10 % ?

LESSON LXXXVIII

1. At what per cent will \$200, in 2 yr., give \$24 interest ?

SOLUTION. — The interest for 1 yr. is $\frac{1}{2}$ of \$24 = \$12; this is $\frac{12}{200} = \frac{3}{50}$ of the principal; $\frac{3}{50} = 6\%$.

At what per cent :

2. Will \$50 in 5 yr., give \$20 interest ?
3. Will \$75 in 3 yr., give \$11 $\frac{1}{4}$ interest ?
4. Will \$300 in 3 yr., give \$63 interest ?
5. Will \$300 in 2 yr. 3 mo., give \$54 interest ?
6. Will \$240 in 3 yr. 4 mo., give \$56 interest ?
7. Will \$200 in 4 yr., amount to \$240 ?
8. Will \$150 in 3 yr. 8 mo., amount to \$183 ?
9. Will any given principal double itself in 20 yr. ?

SOLUTION. — Any principal will double itself at $\frac{1}{20}$ of 100 = 5 %.

10. At what per cent will any given principal double itself in 12 yr.? In 10 yr.? 8 yr.? 5 yr.? 4 yr.? 2 yr.?

LESSON LXXXIX

1. At 6%, for 4 yr. 2 mo., what part of the principal is equal to the interest?

2. At 5%, for 5 yr., what part of the amount is equal to the interest?

3. When the interest for 2 yr. equals $\frac{1}{6}$ of the principal, what is the rate per cent?

4. When the interest for 2 yr. 6 mo. equals $\frac{1}{4}$ of the principal, what is the rate per cent?

5. When the interest, at 10%, equals $\frac{3}{8}$ of the principal, what is the time?

6. When 3 times the yearly interest equals $\frac{2}{5}$ of the principal, what is the rate per cent?

7. When $\frac{1}{6}$ of the interest for 2 yr. equals $\frac{4}{25}$ of the principal, what is the rate per cent?

8. When $\frac{5}{8}$ of the interest for 3 yr. equals $\frac{9}{80}$ of the principal, what is the rate per cent?

9. The interest for 8 mo. is $\frac{1}{25}$ of the principal. What is the interest of \$200 for 1 yr. 4 mo.?

10. If the interest for 1 yr. 4 mo. is $\frac{2}{25}$ of the principal, what is the interest of \$100 for 1 yr. 8 mo. 12 da.?

11. In what time will any principal, at 5%, give the same interest as in 4 yr., at 10%?

12. The interest of A's and B's money for $3\frac{1}{8}$ yr., at 5%, is \$40, and A's money is twice that of B's. What sum has each?

13. Twice A's money equals 3 times B's; and the interest, at 7% for $1\frac{3}{4}$ yr., of what they both have, is \$49. How much money has each?

GENERAL REVIEW

LESSON XC

1. If 12 peaches are worth 84 apples, and 8 apples are worth 24 plums, how many plums shall I give for 5 peaches?

2. Divide 32 peaches among Ethel, Frank, and Lucy, giving Ethel 2 more than Lucy, and Lucy 3 more than Frank.

3. Five times a certain number is 16 more than 3 times the same number. What is the number?

4. A has $\frac{1}{2}$ as much money as B; B has $\frac{1}{3}$ as much as C; C has \$15 more than A. How much has each?

5. If $\frac{3}{4}$ of James's money is increased by \$6, the sum will equal what Thomas has. Both together have \$34. How much has each?

6. A farmer sold $\frac{3}{8}$ of his sheep, but soon afterward purchased $\frac{1}{3}$ as many as he had left; he then had 65 sheep. How many sheep had he at first?

7. If a man can perform a piece of work in 4 days, working 10 hours a day, in how many days can he perform the same piece of work, if he works 6 hours a day?

8. Thomas bought a number of apples, at 2 for 3¢, and as many more at 2 for 5¢. He sold all at the rate of 3 for 7¢. How much per dozen did he gain?

9. A, B, and C rent a pasture for \$92; A puts in 4 horses for 2 mo.; B, 9 cows for 3 mo.; and C, 20 sheep for 5 mo. How much should each pay, if 2 horses eat as much as 3 cows, or as much as 10 sheep?

10. A father who had as many sons as daughters, divided \$20 among them, giving to each daughter \$2, and to each son \$3. How many children had he?

11. What number added to 60% of 200 will make 135?

12. A cistern has a pipe that can fill it in 4 hours and another that can empty it in 5 hours. If both pipes are opened when the cistern is empty, how long will it take to fill it?

13. A can do a piece of work in 2 days and B in 3 days. How long will it take them to do it together?

14. If eggs bought at 18¢ a dozen are sold at 10 for 25¢, how many must be sold to gain \$5?

15. If 1 ox is worth 8 sheep, and 3 oxen are worth 2 horses, what is the value of 1 horse, if a sheep is worth \$5?

16. How many square feet of plastering will it take to plaster the walls and ceiling of a room 20 feet square and 8 feet high?

17. What is the solid contents of a case 8 feet long, 2 feet wide, and 4 feet high?

18. If $\frac{3}{8}$ of A's money equals $\frac{1}{6}$ of B's, and $\frac{3}{4}$ of their difference is \$15, how much money has each?

19. If 10 gal. of water per hour run into a vessel that can hold 15 gal., and 17 gal. run out in 2 hr., how long will the vessel be in filling?

20. Charles bought a number of eggs at 2¢ each, and twice as many at 3¢ each. He sold them at the rate of 3 for 10¢. What per cent did he gain?

21. Mary wishes to divide some cherries among her playmates; she finds if she gives each of them 5 she will have 21 left, but if she gives each 8 she will have none left. What is the number of her playmates?

SOLUTION.— $8-5=3$. An additional 3 cherries to each exhausts 21 cherries; therefore there must be 7 playmates.

22. Henry is 30 steps in advance of John, but John takes 7 steps while Henry takes 5. Supposing the length of their steps to be equal, how many steps must John take to overtake Henry?

23. My chain cost $\frac{2}{3}$ as much as my watch; 3 times the price of my chain and twice the price of my watch were \$100. How much did each cost?

24. A can do a piece of work in $4\frac{1}{2}$ days; A and B together in $2\frac{1}{2}$ days. In what time can B do it alone?

25. I bought a number of pears at 2 for 1¢, and as many more at 4 for 1¢. By selling 5 for 3¢ I gained 18¢. How many pears did I buy?

26. A man sailed to an island at the rate of 9 miles an hour, and returned at the rate of 3 miles an hour. How far away was the island if he was gone 8 hours?

27. A lady wished to buy a certain number of yards of silk for a dress. If she paid \$1 a yard she would have \$5 left, but if she paid $\$1\frac{1}{2}$ a yard, it would take all her money. How many yards did she want?

SOLUTION. — $\$1\frac{1}{2} - \$1 = \$\frac{1}{2}$. A difference of $\$ \frac{1}{2}$ a yard would make a difference of \$5. Therefore there were 10 yards.

28. If \$5 are taken from $\frac{2}{3}$ of A's money, the remainder will equal B's. Both together have \$51. How much has each?

29. If $\frac{2}{3}$ of the gain is $\frac{4}{15}$ of the selling price, for how much will $3\frac{3}{4}$ yards of cloth be sold, that cost \$4 a yard?

30. After 30 feet were broken off a pole, 10 feet more than $\frac{2}{3}$ of the pole remained standing. How long was it at first?

31. Thomas's age is 3 times that of James, and the difference of their ages is 10 years. How old is each?

32. John started from C the same time that George started from D; when they met, $\frac{2}{7}$ of the distance John

had traveled was $\frac{4}{5}$ of the distance George had traveled. From C to D it is 86 miles. How far had each traveled?

33. I sell a certain kind of cloth for 24 cents a yard, and make 20%. If I could buy it for 25% less, and should sell it at 30 cents a yard, how much greater would be my profit?

34. If I sell a lot of eggs at 6¢ a dozen, I shall lose 12¢, but if I sell them at 10¢ a dozen, I shall gain 18¢. How much did they cost a dozen?

35. A dealer sells two cabinets at \$75 each. On one he gains 25%, and on the other loses 25%. What is the cost of each?

36. Three towns, A, B, and C, are situated on the same road; the distance from A to B is 24 miles, and $\frac{7}{8}$ of the distance from A to B equals $\frac{3}{4}$ of the distance from B to C. How far is it from A to C?

37. A, B, and C can do a piece of work in 4 days, A and B in 8 days, B and C in 6 days. In what time can each do it alone?

38. A provision dealer bought a number of ducks, at the rate of 6 for \$1; and twice as many chickens, at the rate of 8 for \$1. By selling them at the rate of 2 chickens and 1 duck for $\$1\frac{1}{2}$, he gained $\$2\frac{1}{2}$. How many of each did he buy?

39. To buy a certain number of oranges at 8¢ each, requires 6¢ more than all the money James has; but if he buys the same number of lemons, at 3¢ each, he will have 29¢ left. How much money has he?

40. A rides 10 miles in $1\frac{1}{4}$ hours, and B, 8 miles in $1\frac{3}{4}$ hours. How far will B travel while A is traveling 18 miles?

41. If A had $\frac{1}{2}$ as many dollars more and $\$2\frac{1}{2}$ besides, he would have \$40. How many has he?

42. A person having three sons, A, B, and C, willed $\frac{2}{3}$ of his estate to A, $\frac{1}{3}$ to B, and the remainder to C; the difference of the legacies of A and C was \$160. What amount did each receive?

43. A man and his wife consume a sack of meal in 15 days. After 6 days the man went on a journey and the woman alone consumed the remainder in 24 days. How long would a sack last each of them alone?

44. If sugar, worth $3\frac{1}{2}$ cents a pound, is mixed in equal quantities with sugar worth $6\frac{1}{2}$ cents a pound, how many pounds of the mixture will be worth \$1?

45. The age of A is 5 times the age of B, and the age of B is twice the age of C. A is 45 years older than C. What is the age of each?

46. When I divide a certain number by 6, the remainder is 4. What is the number if the quotient is 4 times the remainder?

47. A and B together can do a piece of work in 16 days. They work 4 days; then A leaves, and B finishes the work in 36 days more. In how many days can each do it?

48. A man bought 84 eggs, which he intended to sell as follows: 3 dozen, at 1¢ apiece; 2 dozen, at 4 eggs for 3¢; and the rest at 4 eggs for 5¢. Having mixed them, at what rate per dozen must he sell them to get his price?

49. A man agreed to pay a laborer \$2 and his board for every day he worked; the laborer, for every day he was idle, was to forfeit his wages and pay \$1 for his board. At the expiration of 20 days he received \$25. How many days was he idle?

SOLUTION. — If the laborer had worked every day he would have received 20 times \$2 = \$40; hence, he lost by being idle \$40 - \$25 = \$15. Every day he was idle he lost \$2 + \$1 = \$3; hence, he was idle as many days as \$3 are contained times in \$15, which are 5.

50. James was hired for 30 days; for every day he worked he was to receive 30¢ and his board, and for every day he was idle he was to pay 20¢ for his board; at the end of the time he received \$5. How many days did he work?

51. There are two pieces of muslin, each containing the same number of yards; to buy the first at $12\frac{1}{2}$ ¢ a yard, requires 40¢ more than to buy the second, at 10¢ a yard. How many yards are there in each?

52. A staff three feet long casts a shadow 2 feet long. What is the length of a staff that casts a shadow 8 feet long at the same time?

53. If 1 man does as much work as 2 women, and 1 woman as much as 3 boys, how many men would it take to do in 1 day what 12 boys are 6 days in doing?

54. A man is offered some goods by one house for \$1200 with $\frac{1}{6}$ and $\frac{1}{20}$ off, and by another house for \$1200 with $\frac{1}{20}$ and $\frac{1}{6}$ off. Which is the better offer?

55. A laborer engaged to work 24 days, for \$2 a day and his board; he agreed to pay 50 cents a day for his board when he did not work. At the end of the time he received \$38. How many days did he work?

56. If the interest on a sum of money for 3 years at 6% is \$36, what is the principal?

57. For how much should a package of sugar weighing $3\frac{1}{2}$ lb. be sold, to gain 20%, when sugar costs 5 cents a pound?

58. In what time will \$400 double itself at 6%?

59. If I sell some ribbon at 9 cents a yard, I shall lose \$1, but if I sell it at 12 cents a yard, I shall gain 50 cents. How many yards have I?

60. The sum of two numbers is 48, and the larger is to the smaller as 5 to 3. What are the numbers?

61. If a man walks to a lake 10 miles distant at the rate of 3 miles an hour, rows on the lake for $2\frac{1}{4}$ hours, and then returns by trolley at the rate of 9 miles an hour, how long will the excursion take him?

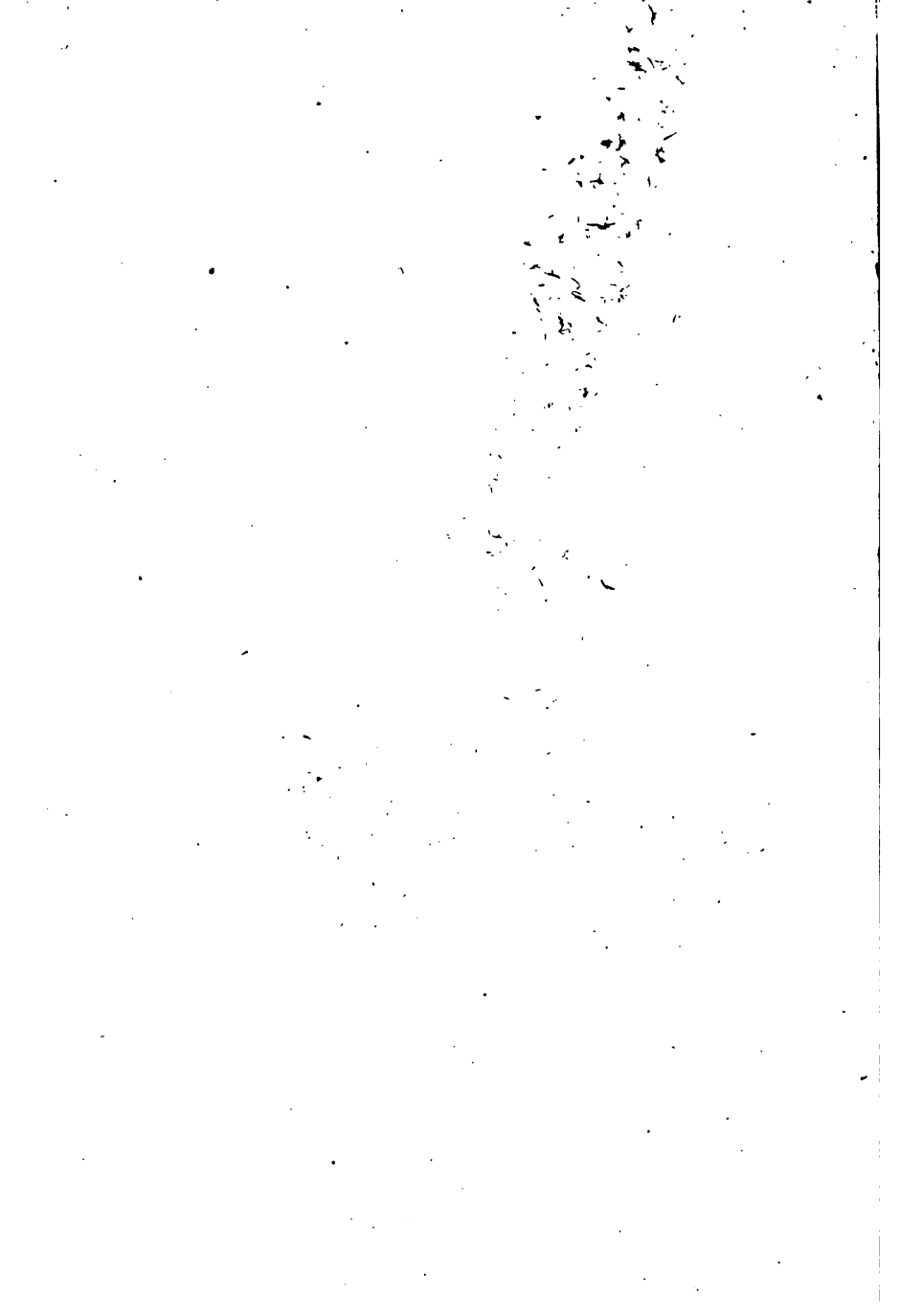
62. At \$2 a yard how much will it cost to carpet a room 13 feet long and 9 feet wide, with carpet 1 yard wide?

63. How much plastering will be required to plaster the walls and ceiling of a room 12 feet square and 10 feet high?

64. How many board feet are there in 3 boards 12 feet long, $1\frac{1}{4}$ feet wide, and 2 inches thick?

65. How many blocks 3 inches long, 2 inches wide, and 5 inches high, will exactly fill a box that is 12 inches long, 4 inches wide, and 10 inches high?





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2. Pure.
3. Pure.

4. Pure.
5. Pure.
6. Pure.

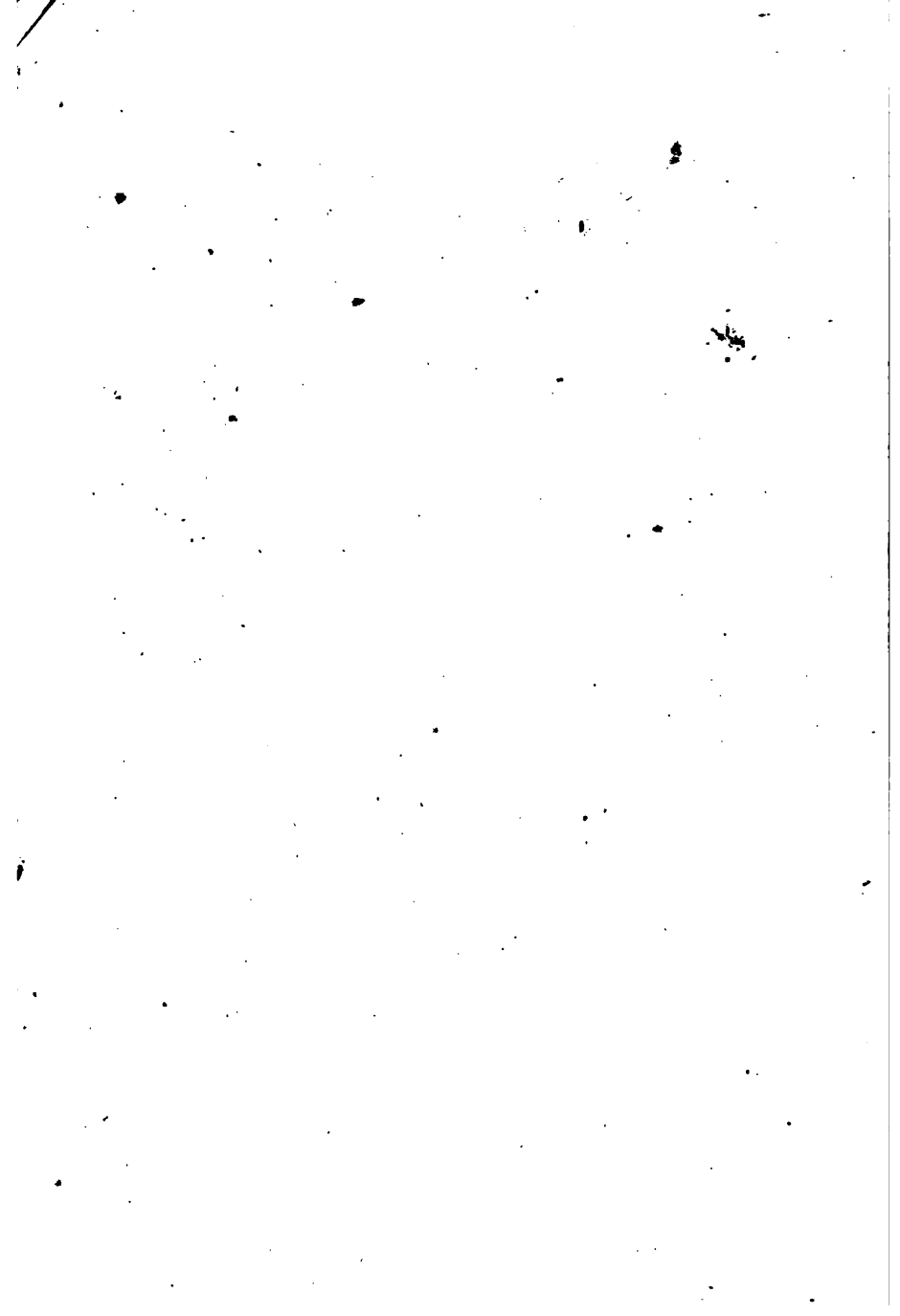
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